D6.3-EU, August 2020

The new renewable energy financing mechanism of the EU in practice

A cooperation case study

AURES II has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817619

D6.3-EU, August 2020, The new renewable energy financing mechanism of the EU in practice

Authors: Felix von Blücher, Malte Gephart, Fabian Wigand (Guidehouse – formally Navigant), Gustav Resch (TU Wien)

Reviewed by: Mária Bartek-Lesi (REKK), Niels Anger (Federal Ministry for Economic Affairs and Energy, Germany), Giula Celi (Ministry of Economic Development, Italy), Agime Gerbeti (Gestore dei Servizi Energetici, Italy), Kristo Kaasik (Ministry of Economic Affairs and Communications, Estonia), Dimitris Tsalemis, Vasiliki Milioni (Ministry for Environment and Energy, Greece), Jevgenija Jankevic (Ministry of Energy, Lithuania), Georges Reding (Ministry of Energy and Spatial Planning, Luxembourg)
Submission date: August 2020 (M22)
Project start date: 01 November 2018
Work Package: WP6
Work Package leader: Guidehouse – formerly Navigant

Dissemination level: PU (Public)

This case study is hypothetical, it does not present Member States preferences and it implies no actual commitment of Member States to participate in the EU RES financing mechanism.

Contents

1 Introduction

In the 2030 framework the European Union has established a binding European Union-wide energy from Renewable Energy Sources (RES) target of at least 32% in gross final energy consumption by 2030. This target is not the sum of national binding RES targets. Instead, it needs to be achieved through voluntary contributions of Member States, adding up to the EU 2030 RES target. One instrument to support and ensure the cost-effective target achievement at European Union level is the "Union renewable energy financing mechanism" (EU RES financing mechanism) as provided in Article 33 of the Governance Regulation.[1]

The basic function of the mechanism is simple: Member States may choose to make voluntary financial contributions to the mechanism (contributing Member States).[2] The mechanism subsequently implements a RES auction which determines support levels and allocates grants to RES projects in hosting Member States, which choose to participate on voluntary basis as well. The hosting Member States transfer the RES target statistics from these RES installations back to the mechanism which then redistributes the RES statistics to the contributing Member States according to their share of financial contributions. Parts of the RES statistics may be redistributed back to the host Member State to account for costs such as grid integration. Member States can participate in a mixed role, i.e. act both as contributing and as hosting countries.

The basic structure of the EU RES financing mechanism represents a pooled cooperation mechanism, whereby Member States cooperate not only on a bilateral basis but multilaterally and facilitated by the Commission. At the same time, the EU RES financing mechanism is effectively a cross-border RES auction.

Key rationales for Member States to participate in the cross-border auction implemented via the EU RES financing are that contributing Member States can access cost-effective RES potentials with resulting support cost savings (compared to national deployment) and that contributing Member States may experience lower transaction costs compared to the individual cooperation mechanisms. In addition, participation in the financing mechanism may be a measure to comply with the 2020 baseline requirement as defined in the Governance regulation and - in case a support scheme approval by DG Competition includes this condition - a solution for the requirement of opening support schemes. Hosting Member States experience all the benefits of RES deployment except that they cannot account the RES production to their targets.

The Governance Regulation introduced the EU RES financing mechanism and provided the Commission with the mandate to "adopt implementing acts to set out the necessary provisions for the establishment and functioning of the financing mechanism." The Commission presented the draft act on 06 May and opened the public consultation to receive feedback until 3 June 2020.[3] This case study is based on the financing mechanism functioning presented in the draft implementing regulation as well as on a project Guidehouse/Navigant implemented together with EY for the European Commission in 2019 which supported the drafting of the regulation.[4] The final mechanism may divert in some detailed aspects from the one presented here as the regulation is still being negotiated with Member States.

This case study is hypothetical, it does not present Member States' preferences and it implies no actual commitment of Member States to participate in the EU RES financing mechanism. The objective of the report is to show the basic functioning of the EU RES financing mechanism. Member State representatives have checked the assumptions made in this study and have provided valuable input. The report includes the following hypothetically participating Member States: Luxemburg as a contributing Member State, Italy and

---

[1] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action.

[2] In this report we refer to Member States only, but do not exclude the possibility for Third Countries to participate in the EU RES financing mechanism.

[3] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12369-Union-renewable-Financing-mechanism

[4] Navigant and EY: Assistance in view of the setting up and implementation of the Union renewable energy financing mechanism, Service request: ENER/C1/2018-568 of framework contract SRD MOVE/ENER/SRD/2016-498 Lot 2.

Germany in a mixed role and Greece, Estonia and Lithuania as hosting countries.

The report first explains the functioning of the mechanism, its basic structure, the process and the rationale of Member States to participate. This chapter also discusses the possible allocation of costs and benefits in the mechanism, the applicable forms of support, the auction design and local administrative contexts. Subsequently, the report puts the mechanism in (hypothetical) practice, assuming the participation of the Member States mentioned above, focussing on illustrating the process of setting up an auction based on the hypothetical preferences of both contributing and hosting Member States. It then provides conclusions and an outlook on a possible implementation of the mechanism.

2 Functioning of the EU RES Financing Mechanism

2.1 Basic structure

The core of the EU RES financing mechanism is described in Article 33 of the Governance regulation, which is "to tender support for new renewable energy projects in the Union". The basic idea is that Member States make voluntary financial contributions to the mechanism. The mechanism then implements a RES tender and thereby determines support levels and allocates support to projects in host Member States. The host Member States transfer the RES target statistics from these RES installations back to the mechanism which then redistributes the RES statistics to the contributing Member States according to their share in the financial contributions used in the respective tender round. The RES statistics are thus pooled per tender round (see Figure 2-1 for an overview of the basic functioning of the mechanism).

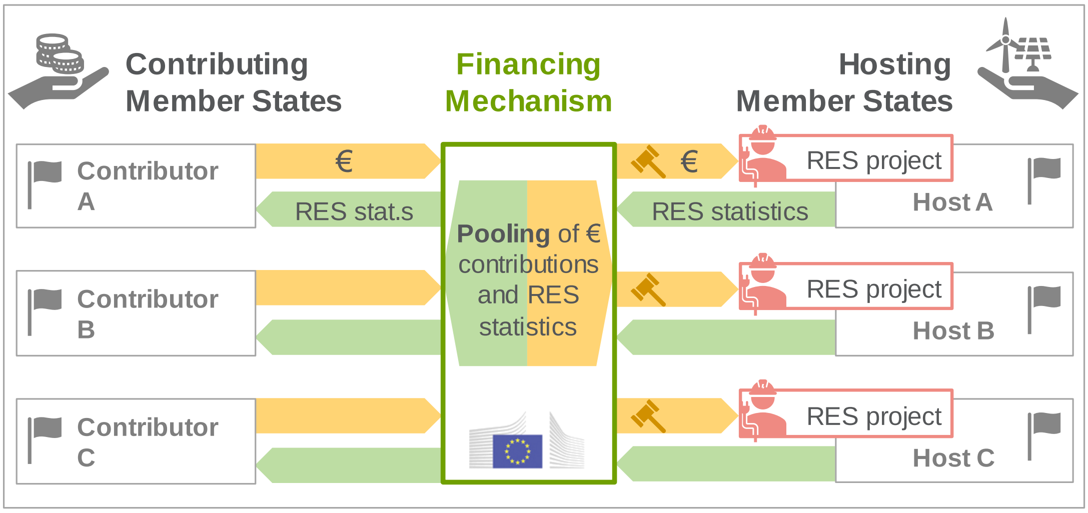

Figure 2-1 Overview of basic functioning of the EU RES financing mechanism

The Governance regulation also makes reference to an "enabling framework", which mainly comprises financial instruments (low-interest loans, junior loans, guarantees) available to projects applying in national tenders or tenders under the financing mechanism upon prior assessment of their financial viability. This report, however, focuses on RES tenders for non-repayable forms of support (i.e. grants), leaving out the role of financial instruments in the EU RES financing mechanism. The mechanism will primarily provide non-repayable forms of support (e.g. feed-in premiums or investment support) which directly trigger RES investments and which result in the transfer of RES statistics. The source for non-repayable support will primarily be voluntary financial contributions from Member States. In addition, the financing mechanism may also receive funding from other European Union funds (such as Connecting Europe Facility / CEF or others), which will however not be in the focus of this case study.

It is important to note that a RES installation receiving support from a national support scheme is not eligible for participation in the EU RES financing mechanism and its production cannot be transferred to another Member State via this mechanism. Consequently, an installation participating in the EU mechanism will result in transferred RES statistics and is not eligible for support in a national support scheme.

The auctions implemented in the EU RES financing mechanism may either be technology-neutral, technology-specific or even project-specific. Projects are selected on a least-cost basis, also in case of technology-neutral auctions. All RES technologies as defined in the RED II would in principle be eligible. This approach includes the option to allocate support across the sectors electricity, transport and heating and cooling or to allocate support across technologies but within each sector ("end-use specific" auction). The key objective of the technology-neutral auction is to maximise cost-effectiveness of RES support.

However, if tenders are introduced across sectors, the comparability of bids from various sectors may be difficult. This occurs mainly in two cases:

- The value of each kWh in the heating sector is lower compared to the electricity sector due to different exergy levels: electricity can be fully converted into heat, but heat cannot be fully converted into electricity.[5]
- In the case of upfront investment support, comparability of bids is challenging even within each sector: investment costs per capacity unit differ substantially between technologies. As a result, the technology with the lowest specific investment cost would win, but it may produce less energy than a technology with higher investment costs, resulting in higher support costs per energy unit and increased uncertainty regarding the energy output. This problem could be solved by tendering operating support or by requesting the delivery of certain energy volumes, even though the latter seems problematic for other reasons.
- In addition, technology-neutral tenders across sectors entail an increased risk of windfall profits for relatively cheaper technologies in case competition among the cheaper technologies is low.

If applied as a technology-specific auction, the EU RES financing mechanism would target specific technologies, technology classes or technology types. It may focus on technologies which are most acceptable to the participating Member States, for instance to ease the system integration of the respective RES capacities in host Member States. In addition, a technology-specific auction may support less mature technologies and thus support their market entry, even though it still triggers least-cost deployment per technology. The technology-specific approach may also focus on least-cost technologies. While the technology-specific auction does not introduce competition between technologies – and in principle also not between sectors –, it may avoid some of the adverse effects and uncertainties discussed under the technology-neutral approach (especially when upfront investment support is implemented).

In case of the project-specific auction, projects would be selected according to the lowest bid for a specific site or project configuration. In the case of selection between different projects and different sites, the lowest bid per type of project or the best (multi-criteria) cost-benefit ratio would be the deciding factor. Project-specific support most likely aims for supporting large-scale projects of strategic relevance (related to innovation, European Union technology leadership, etc.). It may also be the most suitable solution to organise tenders in the transport sector.

[5] Apart from the rule of physics and in terms of the per kWh cost and value of RES-H, this is true for biomass, biogas and geothermal energy. However, the value of each kWh in the heating sector may not be regarded "lower" compared to the electricity sector when considering the use of green hydrogen (e.g. in industry) and the deployment of heat pumps, which play an important role for the decarbonidation of heat. Also, from the point of view of meeting the RES obligation, no difference is made between the use of renewable energy sources in the electricity and the heating sector.

2.2 High-level process description

This section provides a detailed description of each step. An overview of the high-level process of the EU RES financing mechanism is shown in Figure 2-2.

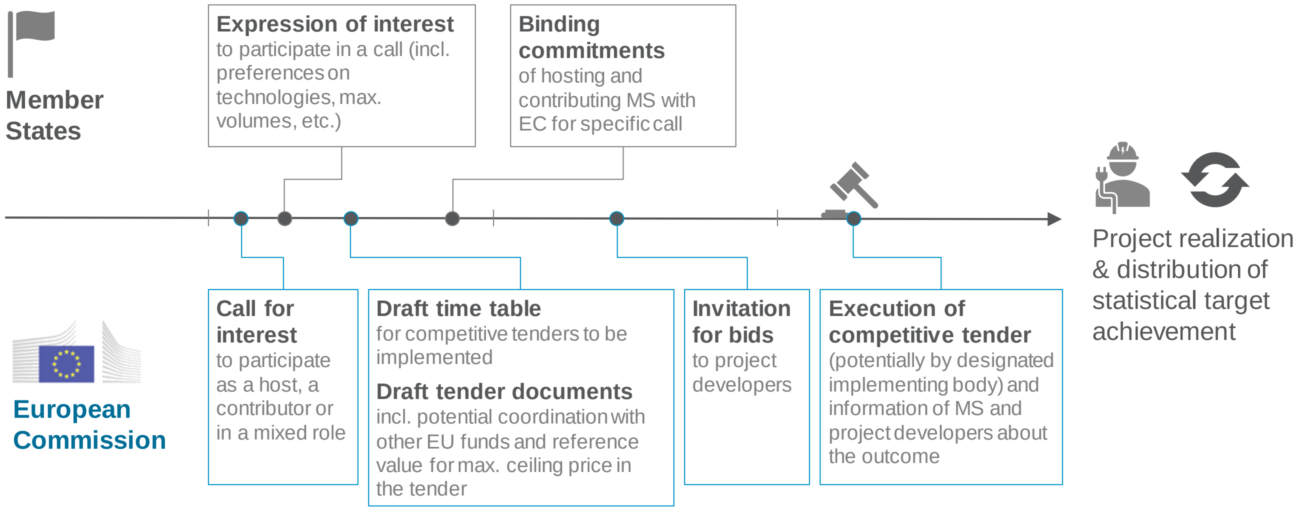

Figure 2-2 High-level process overview

Step 1&2 Call for interest & expression of interest

The preparation phase for individual tender rounds is either organised in regular intervals (e.g. every two years) or whenever Member States actively express interest in a new auction round to the Commission. The European Commission would start this process by launching an informal, non-public expression of interest (EOI) phase, whereby Member States express their interest to participate in the mechanism as contributing or hosting states or in a mixed role. Interested hosting Member States are asked to provide information on preferences or flexibilities related to their participation in the planned tender round(s), including the available maximum capacities (per technology and year) which are made available on their territory, maximum project sizes, site or geographical constraints and minimum requirements regarding the share of statistical benefits they request to participate.

For contributing Member States an important aspect is whether the EU RES financing mechanism is cost-competitive compared to other options to comply with their expected and/or planned contribution to the EU target. Their alternatives include national deployment, individually negotiated cooperation mechanisms (e.g. statistical transfers, joint projects or joint support schemes) or the Union Renewable Development Platform (URDP) as defined in Article 8 of the RED II.[6] A maximum price for contributing Member States will then be determined based on the Member States' expressions of interest. See for a detailed description on how the maximum price is determined in section 2.4.1 on the allocation of costs and benefits.

Step 3: Draft timetable & tender documents

On the basis of the interest expressed by participating Member States and third countries, the Commission prepares draft call(s) for proposals. They include the maximum price, the technology focus, the good and volume to be tendered, eligible project sizes, the type of support (e.g. upfront investment support or operating support) and other applicable tender design parameters. Moreover, the documentation should include practical arrangements such as the final date of bid submission and the dates on which bidders are informed about the outcome of the bid evaluation. Following this, Member States who have previously expressed an interest are consulted on the draft call for proposals. In addition, private stakeholders such as project

[6] Making contributions to the EU RES financing mechanisms is one option to comply with their expected and/or planned contribution to the EU target that can, of course, be combined with other options including national deployment, but also making use of a platform that will be created by the European Commission to facilitate statistical transfers between EU Member States.

developers may be consulted to be able to voice their opinion on the proposed tender design in line with international best practice.

Step 4: Binding commitments

In a next step, the Commission sets up binding contractual arrangements with contributing and hosting countries. A binding contractual arrangement is first set-up with hosting Member States, who contractually commit to the European Commission to allow projects located on their territory to receive support under the mechanism. Once the contractual arrangements with the hosting Member States are made, contributing Member States contractually commit to the European Commission to provide payments to the mechanism before grant agreements with successful bidders are signed.

Once all binding arrangements with participating countries are finalised, the draft call for proposal is consolidated and the upcoming tender round is announced by the European Commission or an implementing agency, including at least information on participating hosting and contributing Member States, available volumes per technology and sector, timing of the tender, the type of support as well as other key tender design elements. The announcement ideally takes place roughly one year before the actual start of the tender, so as to provide sufficient room for project promoters to prepare their bids and ensure investment security for project pipelines.

Step 5: Invitation for bids

Based on the announcement, the Commission invites bidders to submit their bids. The invitation for bids ideally takes place between 6 weeks and 3 months before the tender. The applicable call for proposals/invitation for bids should include all relevant information for bidders, such as the specific tender design and relevant technical details regarding the submission process (see content requirements on draft call for proposals above). The European Commission or an implementing agency receives submitted bids and opens received bids once the tender deadline is reached.

Step 6: Execution of competitive tender

The Commission (or an implementing agency) first checks bids submitted by project developers in terms of their compliance with financial prequalification requirements and national requirements such as applicable site restrictions. Bids not complying with these requirements are not evaluated further. The checking of bids can be done in cooperation with the relevant national regulatory authorities (NRAs) or any other national entities that are responsible for checking bids within the nationally established procedures[7], given their knowledge of the respective national regulatory framework, e.g. in terms of size restrictions. The Commission then ranks the remaining bids on the basis of their bid price and awards bids until the set volume is reached. Potential technology- and/or country-specific volume caps are considered.

Before grant agreements are signed with successful project developers, contributing Member States (and potentially private contributors) will have to have paid into the mechanism in line with their financial commitment set out in the previous contract with the European Commission. Finally, the European Commission or an implementing agency informs participating bidders on the tender outcome and publishes tender results and prepares and signs contracts with successful bidders.

Monitoring, accounting and support payment disbursement

A European Union implementing agency and relevant NRAs would be responsible for monitoring project realisation of RES projects that receive grants from the mechanism. They submit status reports on project implementation as well as financial reports to the European Commission and Member States. The European Commission or an implementing agency implements the accounting of RES production shares on a rolling basis with the support of national institutions in charge of this task at national level. This includes the allocation of RES production shares in line with Member State contributions made to the mechanism and hosting Member States requested share of statistical benefits (if applicable). The Commission would also be responsible for the disbursement of support payments.

---

[7] The national entity most suitable to support the checking of the bids may be determined by each hosting Member State.

2.3 Motivation of Member States to participate

There are important motivations and benefits for Member States to participate in the mechanism as well as barriers to do so. This section analyses benefits and barriers to participate

- as contributing Member State, i.e. paying into the mechanism;
- as hosting Member State, i.e. hosting projects supported by the mechanism on its territory;
- in a mixed role, i.e. as contributing and hosting Member State.

2.3.1 Contributing Member States

There are various benefits related to participating in the mechanism as a contributing Member State:

- The first and obvious benefit of contributing to the mechanism is to receive RES statistics, counting towards the contributor's national RES share.
- Accessing RES potentials in other Member States may lead to support cost savings compared to purely national RES deployment. The likeliness of effectively accessing cheap RES potential in other Member States is higher when using the mechanism rather than relying on individual cooperation mechanisms, given that the traditional cooperation mechanisms have proven to be burdensome to implement.
- Contributing Member States may benefit from the European Commission's (or a respective implementing body's) better credit rating compared to their own rating in case they participate in the mechanism, potentially further decreasing the cost of support.
- The mechanism can reduce transaction costs compared to the traditional cooperation mechanism, given that it does not require a bilateral or multilateral negotiation of, for instance, support schemes, allocation of costs and benefits and contracts.
- The Governance Regulation states in Article 32(4) that from 1 January 2021 onwards the RES share shall not fall below the 2020 target. According to the most recent renewables progress report, this is not ensured for all Member States. This may constitute a relevant rationale for some Member States to consider participating in the mechanism, since an adequate financial contribution to the mechanism may meet the requirement of Article 32(4) for Member States to take additional measures and, therefore, may be a suitable solution to stay above the baseline.
- The approval of RES support schemes in various Member States by the Commission (in particular DG Competition) is related to the condition of partially opening their support schemes for installations abroad. The mechanism may serve as a way to fulfil this condition.
- Participating in the mechanism may be necessary in case certain developments and/or structural challenges make national RES deployment more challenging than anticipated, such as negative trends in local planning and permitting or macroeconomic developments impacting a country's general economic situation and its energy demand. For instance, an increase in energy demand due to economic growth above initial expectations may trigger participation.

A key barrier to participate in the mechanism as a contributing Member State may be the lack of political acceptance. Supporting RES deployment outside of its national territory and missing the benefits of domestic RES deployment has been a barrier for participating in the cooperation mechanisms in the 2020 framework. This barrier can be expected to be relevant for the mechanism as well. The two remedies in this respect are, first, to explore the benefits of contributing to the mechanism (mainly support cost savings and legal compliance) and to communicate them clearly throughout the process. Another option is to participate in a mixed role (i.e. as a contributing and hosting Member State), see below.

2.3.2 Hosting Member States

The benefits of participating in the mechanism as a hosting Member State are similar to a domestically driven RES deployment, including:

- The long-term perspective defined in the Governance regulation (Article 15) is to fulfil the objective of the Paris Agreement. This requires, among other things, a decarbonisation of the energy system in each Member State. Adding RES capacities beyond the capacities triggered by national support schemes is an additional step towards this structural transition. This aspect may be particularly relevant in Member States which have to replace existing capacities in the short term, for instance, because of a planned coal phase-out or because aging energy conversion assets have to be replaced.

- A decarbonised energy sector (and more broadly, a decarbonised economy) implies structural economic changes. New and innovative business models have to be developed and implemented. Increasing the RES share beyond the national trajectories for the contribution towards the Union-wide 2030 target as outlined in the Governance Regulation helps moving faster towards this structural change. In concrete terms, participating as a host triggers additional investments in the respective Member State and has positive employment effects.
- RES deployment reduces greenhouse gas emissions and the effect is increased if RES beyond national planning is deployed. Statistical and actual benefits from GHG emission reductions that result from projects implemented under the mechanism are not transferred to the contributing Member State(s), constituting a direct benefit for the host.
- RES deployment beyond initially planned volumes decreases import dependency by reducing the share of imports in total energy consumption and by diversifying energy sources.
- When aging fossil fuel power plants are substituted with RES capacities, air quality improves.
- Hosting Member States may use their participation in the EU RES financing mechanism to foster political cooperation with other Member States, including to leverage their cooperation in policy fields beyond renewables support.
- The major additional benefit of participating as a hosting Member State in this respect is that all the above-mentioned benefits come free of direct support costs, as these are fully paid for by the contributing Member State(s).

At the same time, several challenges can be expected for hosting Member States:

- Tenders implemented by the mechanism make use of a host country's RES deployment potentials. Potential sites are, as a result, no longer available for national deployment supported under a national support scheme and the national contribution to the EU target. However, participation in the mechanism is voluntary and Member States can define the volumes they want to participate with (also per year), the technologies they prefer to be built on their territory, the regions where to build RES, types of sites to be eligible for participation or even specifically identified sites. This tailored approach will allow Member States to maximise the benefits from participation and to minimise adverse effects.
- Member States may experience system integration costs due to increased RES deployment. These costs relate to grid reinforcement/extension and - in countries with high RES penetration or structural gird congestion – increased re-dispatch costs. These costs may be reflected in the allocation of costs and benefits or internalised to RES projects.
- Hosts may experience some transaction costs related to setting up the legal and administrative framework and carrying out related tasks. This mainly relates to the monitoring and communicating of production data. The mechanism will create a learning curve on how those elements are implemented in the most efficient manner and as a result transaction costs are expected to decrease over time. In addition, hosts will set up a framework when they first participate which can be used for subsequent rounds of tenders.
- The elements discussed above may limit public and political acceptance of acting as a host and potentially induce resistance against additional RES deployment. By and large, these barriers can be addressed through regular and sufficient updates of planning instruments (i.e. National Energy and Climate Plans (NECPs) and national infrastructure planning) and by an adequate communication strategy, including a clear communication of the net benefits of RES deployment combined with a proactive management of local concerns. For instance, national consultations should specifically assess the option to act as a hosting Member State.

2.3.3 Mixed role: participation as contributing and hosting Member State

Member States may not only participate in a hosting or a contributing role, but in a mixed role. A key rationale to do so is to overcome the barriers to participating as a contributing Member State alone, i.e. political resistance against financing RES deployment abroad. In this context, a solution could be to simply allow for at least part of the RES deployment to be realised on the contributing Member States' territory.

An additional rationale is the fact that a mixed role can be considered a truly cost-effective approach towards RES deployment: contributing financially without an ex-ante determination of plant locations would allow for the most cost-effective RES deployment throughout the European Union. An EU-wide auction as implemented by the EU RES financing mechanism deepens the market integration approach of RES support, as it works across borders.

2.4 Allocation of costs and benefits

Two aspects require particular attention when discussing the allocation of costs and benefits:

- The determination of the size of contributions from Member States to the mechanism,
- The allocation of statistical benefits.

2.4.1 MS contributions

The process of determining the size of the contributions of the Member States to the mechanism is bound by the following conditions.

- First, the European Commission cannot pre-finance Member States' contributions. That means that Member States must have committed to the transfer of sufficient financial contributions to ensure that support payments are fully covered.
- Second, Member States need to know the budgetary implications of the participation in a specific tender round of the mechanism before making financial commitments.
- Third, the bid level of awarded projects and thus the exact level of support is only known once the tender has taken place.
- Fourth, the tender results and thus the bid level of the awarded projects will significantly depend on the level of participation of Member States as hosting countries as this determines the available RES potential, i.e. the supply side in the tender, as well as on the level of participation of contributing Member States, i.e. the demand side in the tender.

These conditions require to establish ex-ante a "maximum price" (also called ceiling price) for the participation in a specific tender round of the mechanism. For each tender, the European Commission may calculate a maximum price per MWh (or per MW per technology) and share it with the Member States before they commit to the mechanism. The maximum price is determined in a way that ensures that the actual support payments that will result from the tender are equal or lower to the maximum price (but not higher), thus providing a conservative estimation for the actual support costs that contributing Member States ultimately need to cover. Only in the worst case (low competition, etc.) the strike price in the tender will be equal to the maximum price.

As estimating a maximum price is only possible once both the level of supply and the level of demand are known, we suggest applying the following iterative process per tender round. The presented process has the purpose of making the conditions of participation transparent before contributing Member States enter into binding commitments.

Furthermore, the process of determining a maximum price has the purpose of calculating a minimum budget that is required by a Member State for the specific requirement of taking action under article 32 of the Governance Regulation (making a voluntary financial payment to the mechanism under the gap-filling purpose), irrespective of the actual production.

The following process can be used to establish a maximum price:

- Based on the Expressions of Interest submitted by hosting Member States, the Commission gathers information on the aggregated potential for a specific technology (or group of technologies) of all hosting Member States.
- The aggregated potential is used to determine a range of potential support costs that would result from a tender, given the available aggregated potential and expected revenues. Since the tender result is dependent on the level of demand by contributing Member States – which at this stage is not known – an indicative maximum price for a low, medium and high tender volume will be derived from the cost-supply curve.
- The three indicative maximum prices are then communicated to Member States.
- Taking the indicative maximum prices into account, interested contributing Member States are asked to provide information on their intended financial contribution to the mechanism in terms of budget, capacities or generation as well as maximum intended financial contributions per tender round (if applicable). Member States participating in a mixed role would provide information on aspects related to

hosting as well as to contributing Member States.
- Based on the information provided by the contributing Member States, a final maximum price is determined serving for contributing Member States to assess their actual will to contribute, based on their alternatives.

2.4.2 Statistical benefits

On the transferred statistical benefits Article 33 (5) of the Governance Regulation states that "every year, renewable energy generated by installations financed by the financing mechanism shall be statistically attributed to the participating Member States, reflecting their relative payments". Furthermore, Article 33 (5) of the Governance Regulation stipulates that the allocation of statistical benefits needs to follow the principle that "projects supported by this financing mechanism that are financed by other sources than Member States payments shall not count towards Member States' national contributions but towards the Union binding target". Thus, the attribution of statistical benefits should be done according to the actual contributions made.

To provide predictability and transparency for all participating Member States, the rules on the allocation of the statistical benefits must be known prior to the binding commitments of the contributing Member States. Furthermore, rules should provide certainty over the entire period of statistical transfer, i.e. changes to the allocation of RES statistics can only be made based on rules that had been agreed prior to the tender.

The statistical benefits related to the generation of a RES installation can either be transferred to the mechanism over the lifetime of support or the lifetime of the specific RES installation. Which of these two options is chosen needs to be specified by the European Commission prior to the call for interest of potential hosting and contributing Member States.

The first basic option for the allocation of statistical benefits is to allocate the entire statistical benefits to the contributing Member States only, according to their relative payments. The advantages of this option is a simple and transparent methodology of allocating statistical benefits that applies equally to all participants of the mechanism. It provides clarity for all involved Member States and strong incentives for making contributions to mechanism. Such a methodology would also be in line with the principle of article 33 V of the Governance Regulation ("every year, renewable energy generated by installations financed by the financing mechanism shall be statistically attributed to the participating Member States, reflecting their relative payments"). However, if no statistical benefits of the RES production remain with the host country, the incentive for Member States to host such installations is reduced.

Against this background, splitting of statistical benefits between contributing and hosting Member States seems reasonable, i.e. allocating parts of the statistical benefits to the hosting Member States. This is justified as hosting Member States bear costs despite not contributing to the support payments. Costs for hosting Member States relate to the system integration of additional RES capacities and potentially also to the grid connection of individual projects (depending on the grid connection regime). Second, hosting Member States give up part of their domestic RES potential, which in the long term may lead to higher domestic costs of RES development. Third, distributing parts of the statistical benefits to the hosts increases the incentive to participate as hosting Member States. The more Member States are willing to host installations under the mechanism, the better the functioning of the mechanism, the cheaper the auction outcomes and the more attractive it will be for contributing Member States. However, the main share should go to the contributing Member States to maintain an incentive to contribute to the mechanism.

To implement this, a flat-rate approach that applies to all cases (e.g. 20% of statistical benefits attributed to hosting Member States) can be a simple solution. However, such a default case may cause acceptance problems for individual cases of application, which underlines the need to provide for more flexibility. The flat-rate approach foresees that prior to each tender round, all participating Member States (hosts and contributors) agree on a splitting rule that is applicable to all participants. For example, for a specific tender round, the splitting rule may be 80/20, and in another tender round, it may be 70/30.

The splitting rule that is established for a particular tender round also has an impact on the indicative maximum price that is communicated to the potential contributing Member States, as well as on the final price upon which a binding commitment is made. The higher the share of statistical benefits retained by the hosting Member States, the more support needs to be paid per RES benefit transferred to the mechanism.

Consequently, if hosting Member States retain a higher share, the higher the price for the contributing Member States for the transferred RES shares.

A more flexible and tailored approach may be needed to account for:

- Differences between technologies and sectors
- Different preference of hosting Member States
- A dynamic perspective on system integration costs

When defining the splitting rule, the following criteria may be reflected for each tender round:

- Maturity of technology: For less mature technologies, the share of support payments in total revenues of the projects will be higher. Therefore, contributing Member States bear a relatively higher share of the total costs incurred to realize the projects (i.e. costs related to grid development, system integration as well as support costs). Retaining a smaller share of the statistical benefits for the hosts may be considered.
- Likelihood of having a very low auction result: If auctions result in very low (e.g. close to zero support) bids, for example because technologies are very mature and/or competition is high, contributing Member States bear very low support costs. Retaining a higher share of the statistical benefits for the hosts may be considered, as the host provides low-cost potentials/sites to the mechanism and the project could have been built domestically at very low support costs as well. Auction results cannot be predicted, but past auction results in the participating host Member States can be used as an indicator for the likelihood of having a very low auction result.
- Impact of technology on system integration costs: The higher the impact of a tendered technology on the system integration costs, the higher a fair share of statistical benefits for hosting Member States. However, the extent to which a technology incurs system integration varies between Member States, depending on a variety of factors of the energy system as well as on regulatory conditions, such as the grid connection regime.
- Preferences of participating Member States: The default split should take into account the known preferences of hosting Member States as well as the acceptability for contributing Member States in order to find a right balance. Ultimately, the default split suggested by the European Commission needs to be a compromise, based on the Member States' feedback.

Individual splitting rules per host Member State

Defining a splitting rule that applies equally to all participating countries in one specific auction round improves the mechanisms operability, transparency and fairness. But Member States may prefer to determine individual target attribution splitting per hosting country. For example, in a particular tender round, host country A may request 20% of the RES statistics (80/20-split), whereas host country B may request that 30% of the RES statistics (70/30-split).

Allowing for hosting Member States to determine their own individual target attribution split has some advantages. First, by determining their individual split, hosting countries have flexibility in defining a central aspect of the terms and conditions of their participation. This could increase the attractiveness to participate as a hosting country and thereby increase the availability of low-cost potential offered to the mechanism. As a result, the mechanism may also be more attractive to potential contributing Member States. Second, it avoids that all participating Member States have to agree on one splitting rule or that the European Commission has to define a flat-rate splitting rule applicable to all participants, which may not be acceptable to some potential participants.

Allowing individual splitting rules for hosting Member States, however, has important disadvantages. First, different splitting rules can be seen as a discrimination between Member States and may be perceived as unfair, especially by those hosting Member States that retain a lower share. Second, it adds complexity to the tender, as all bids would need to be adjusted to the same denominator when making a bid decision. And third, individual splits can lead to a situation in which the projects awarded may not be those with the lower support costs.

To ensure that bids are compared on equal terms from the perspective of the contributors, bids should be awarded based on the ratio of support payments per RES statistics transferred to the mechanism. This means that all bids must be compared on the basis of "€ per MWh transferred to the financing mechanism", i.e. all bids must have the same denominator. In case of investment aid, the same ratios would apply, and bids would be compared on the basis of "€ per MW-share of which production is transferred to the mechanism". This requires adjusting the bids in the tender according to the splitting rule of the country in which the projects will be located. For example, a bid from country A with a splitting rule of 80/20 would be divided by 0.8 and a bid from country B with a splitting rule of 70/30 would be divided by 0.7.

As a result of the adjustment of bids to the same denominator, the tender will award the projects with the best ratio of "€ per MWh transferred to the financing mechanism", ensuring cost-effectiveness from the contributors' perspective. However, the projects awarded may not be those with the lowest support costs. Projects with a lower need for support but located in a host country with a less "favourable" splitting rule (e.g. 70/30) may lose to projects that require more support but are located in a host country with a splitting rule that grants more RES statistics to the contributors (e.g. 80/20). Thus, from a system's perspective, allowing for individual splits per host country can result in sub-optimal result in terms of cost-efficiency. Individual splits per host country add an administratively determined element that has an impact on the competitiveness of projects in the tenders under the mechanism. This can be considered as another disadvantage. Furthermore, the incentive for potential contributing Member States to participate in the mechanism may be reduced, depending on the share retained by the hosting countries.

Considering these advantages and disadvantages, a uniform splitting rule per auction round for all participating Member States appears to be the preferred option.

Allocation of statistical benefits in case RES installations do not require support payments

Installations that successfully participated in auctions for grants under the mechanism, may not require grants in two cases:

- Case 1 – Zero support payments despite higher bids (only possible if support is paid in form of a floating premium/Contract for Difference (CfD)): If the market value is above the bid level for a floating market premium, no premium is paid. This may be a temporary or a frequent situation, depending on the development of the market value. The support scheme still fulfils the function of providing revenue stability to RES projects.
- Case 2 - Zero support bids (very unlikely outcome unless grid access is restricted by the tender, e.g. in the case of offshore wind): Bidders project that the installation can refinance with market revenues alone and bid "zero". No support payments are required over the entire period of operation.

The general principle of "who pays the support, receives the benefits" may not apply in these cases. Therefore, the question arises how the statistical benefits are allocated. To account for both cases, the European Commission and the participating Member States have the option to agree *ex-ante* on a deviation from the general splitting rule and define a higher share of the statistical benefits to be retained by hosting Member States. It should be noted, however, that these cases are not likely to occur frequently, as host Member States may keep such projects for their domestic target achievement, especially if they expect case 2.

Sharing of additional system costs in host countries

System costs should not be calculated and compensated on an individual cost-basis. Instead, a compensation in form of a flat rate statistical share (e.g. 80/20) should be negotiated between the Commission and the host countries ("splitting rule"). This splitting rule reflects the host countries' selling price rather than their actual system costs. If the requested share is too high, it will not be acceptable to contributing Member States, i.e. supply and demand cannot be matched. Independent of the statistical compensation, host countries may internalise system costs to RES projects through their regulatory framework. This particularly applies to grid extension and reinforcement costs that can be internalised through deep connection charges, even though such charges reduce the attractiveness for RES project developers and the competitiveness of the respective projects in the EU auction.

In sum, the splitting rules need to be clear to all participants before they enter a binding commitment for a specific tender. The mechanism should allow for the splitting rule to be adapted for each tender. A flat rate split applicable across all Member States at the beginning of the EoI phase provdes simplicity. Allowing for individual splits per host Member States should only be considered if deviating views by the Member States cannot be accommodated otherwise. Bids need to be adjusted to ensure that the award decision is based on "€ per MWh transferred to the mechanism".

2.5 Form of support

Article 33 of the Governance Regulation mentions different types of support that may be provided, including (but not limited to) "a premium additional to market prices". Such support shall be "allocated to projects bidding at the lowest cost or premium". In addition, the mechanism may provide "low-interest loans, grants, or a mix of both".

This report understands "grants" as a financial contribution by way of donation, i.e. a non-repayable form of support. It can take the form of operating support (as a floating or fixed premium) or of an upfront investment support (for a graphic representation of the support scheme, see Figure 2-3).

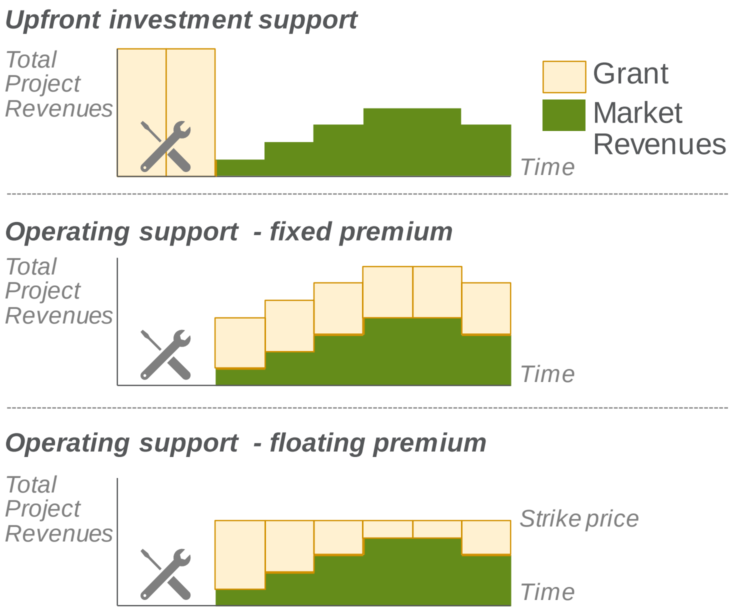

Figure 2-3 Overview of forms of support

The two principal forms of grants are operating support and investment support.

Operating support is the more common form of RES support in the European Union and several variants exist. Common applications of operating support include fixed premiums, floating premiums and Contracts for Difference (CfD). While the evaluation of advantages and disadvantages compared to upfront investment support largely depends on which of these schemes is applied as well as their specific design (see below), several general characteristics can be assessed.

The main commonality of these schemes is that operating support is paid on top of the market revenues. As such, operating support generally incentivises plant output, since support is paid per kWh. In contexts where support payments make up major parts of the project revenues, this increases the *effectiveness* in terms of (generation) target achievement compared to investment support and thereby also the cost-effectiveness of support. However, as support shares in total revenues continuously decrease in the European Union, this argument becomes less relevant. This is specifically true for variable RES which tend to maximise production in any case, as they have close-to-zero operating costs. In terms of *cost-effectiveness*, no general effect of operating support can be observed compared to upfront investment support, as the impacts on cost-effectiveness depend on the detailed design of the support.

A general disadvantage of operating support is that it has a distortive effect on the dispatch of RES installations and therefore creates adverse effects on *market integration*. In the case of variable RES, negative prices would in principle incentivise halting electricity infeed. However, when operating support is paid, this incentive applies only if prices fall below the negative value of the premium payment in case of a fixed premium, since any prices above this level would still generate net benefits for the producer. In case of floating premium, any difference to the bid price would be paid (unless there is a rule prohibiting to do so in case of negative prices, as in many countries). In the case of dispatchable RES, distorted feed-in is also incentivised at positive prices (as without support the feed-in would stop at positive market prices, which are below the operating costs). Specifically, in the context of the mechanism, another challenge related to operating support is that it typically must be paid over longer periods of time than investment support, e.g. 15 or 20 years, thereby exceeding both the timeframe of the Multiannual Financial Framework (MFF), which is the seven-year framework regulating annual budget of the European Union as well as the timeframe of the 2030 framework. Thus, funds would have to be reserved beyond this time frame. It is unclear how exactly this could be realised, but it would result in additional administrative burden.

Operating support is in principle applicable for the electricity and heating sector. However, it is much less common in the heating sector where usually upfront investment support is provided. Operating support does not appear to be suitable for the transport sector as the technical options appear to be more compatible with quotas/obligations and investment support (for a more detailed discussion of support for the heating and transport sectors, see section 3.3).

The most common forms of **operating support** are fixed premiums, floating premiums and Contracts for Difference (CfD). A **fixed premium** scheme entails a fixed payment per kWh on top of the market price. A key advantage of fixed premiums compared to floating premium/CfD is that *market integration* for both operational decisions and investment decision is incentivised. More specifically, the long-term market values are relevant for producers, as they will impact the overall revenues of the project. It has the disadvantage that it increases the risk of the winner's curse compared to a floating premium/CfD because long-term price forecasts are necessary but always related to high uncertainties. This may in turn reduce the effectiveness of support.

In a **floating premium** scheme (also called asymmetric contract for difference), the support payment is paid as difference between a strike price determined in the tender and a reference market price. The reference market price can be determined on an annual, monthly, daily or hourly basis. A floating feed-in premium reduces revenue risks for producers compared to a fixed feed-in premium or upfront investment support. As a result, it reduces the risk of the winner's curse and thus has a positive effect on the effectiveness of the support. In addition, it has a decreasing effect on the cost of capital, resulting in improved *cost-effectiveness* of the support scheme. A disadvantage is that *market integration* is restricted to operational decisions. More specifically, a floating feed-in premium does not expose participants to risks of long-term market values and therefore does not create incentives for investments towards price zones with higher market values. As a result, this might negatively affect *cost-effectiveness* of the support scheme, as more support is needed for a project in a low-price area than in a high-price area. An additional challenge pertaining to floating premiums is that the upfront determination of necessary support payments for each installation over their lifetime is difficult, as this crucially depends on the production over the lifetime of the installation multiplied with the market values, which are difficult to determine in advance. Moreover, a floating feed-in premium entails more design elements than a fixed premium: the reference period to determine the average market prices has to be defined, as well as the price zone which is used to determine the reference value (e.g. that of the host Member State, of the contributing Member State(s) or a mix thereof). This increases the administrative burden related to the floating feed-in premium.

Investment support usually entails a fixed upfront payment which is related to installed capacity (i.e. x € per kW). Compared to operating support, upfront investment support has the advantage of decreasing a project's capital expenditures and thus the required financing volume. This in turn may decrease overall capital costs and, as a result, increase the *cost-effectiveness* of support. Moreover, upfront investment support incentivises *market integration* of RES-E projects: similar to a fixed feed-in premium, investors will choose price zones with higher market values (decreasing the support costs and increasing *cost-effectiveness* of support compared to a floating premium/CfD). Finally, the use of upfront investment support in the context of the mechanism may incur less administrative burden, given that support does not have to be paid over a longer period of time.

However, the fact that bidders must anticipate long-term market values implies the risk of the winner's curse, i.e. being awarded support which ultimately does not suffice to ensure commercial viability of a project. Another disadvantage of upfront investment payments compared to floating premium/CfD is that – as in the case of fixed premiums - RES-E projects are exposed to full short- and long-term electricity market (revenue) risks, which increases the cost of capital, in turn negatively impacting the *cost-effectiveness* of support.

Another challenge of upfront investment support is that a bid selection according to the specific investment costs per capacity does not reflect actual energy production and may result in the selection of bids with comparably higher support costs. If the investment cost is slightly lower but the production is significantly lower compared to another bid, the required support per energy unit produced is higher in the selected bid. This challenge is particularly relevant in the context of technology-neutral auctions. In the context of the mechanism another challenge is relevant: if upfront investment support is disbursed but the project fails afterwards, support money may be lost. Possibly, the disbursement of investment support could be related to proven project milestones in order to avoid such losses. However, project developers are incentivised in any case to maximise their revenues, i.e. to ensure that projects operate.

Thus, upfront capacity payments are not suitable for the technology-neutral window, as the comparability of bids is challenging: investment costs per capacity unit differ substantially between technologies. Upfront investment support is in principle applicable for all sectors. In the heating and cooling sector, it is very common to use investment support. However, there is much less experience with investment support in the electricity sector as national support schemes generally provide operating support as payments per energy unit (e.g. kWh). Since investment support deviates from established practice, participating Member States and potential bidders may require some time to familiarise with this form of support and may – at worst – be disincentivised from participating in a tender under the financing mechanism.

In sum, especially floating premiums perfrom well in terms of effectiveness, followed by fixed premiums and then upfront investment support. Upfront investment support performs poorly in case it is applied in a technology-neutral manner, but similar to a fixed premium, if applied in a technology-specific manner. The cost effectiveness depends a lot on the specific design of each form of support and there are different effects which at the same time increase and decrease a support form's performance. In terms of market integration, the fixed premium and the investment support perform best. The administrative burden is much higher with operating support compared to upfront investment support, but within operating support is lowest if a fixed premium is auctioned.

Against this background, in this report an upfront investment aid will be used for the hypothetical auction round.

2.6 Auction design

Best practices in auction design have been discussed in detail as part of the AURES I and AURES II projects and our recommendations are based on these discussions. Here, we put a focus on the design of a tender in the specific context of the EU RES financing mechanism, i.e. a cross-border auction implemented by the Commission.

2.6.1 Auctioned good and volume

In renewable energy auctions, the tendered good and its volume can be defined in terms of capacity (in MW), energy production (in MWh) or in terms of budget (€). In practice, tender volumes in terms of capacity have been the most commonly used form. In case the target volume of a tender is expressed in terms of installed capacity, the tendered good is in most cases also defined in terms of capacity. A bidder therefore commits to install the offered capacity within the specified delivery period.

Defining the tendered good and volume in *terms of capacity (MW)* comes with the advantage that it provides a good planning environment for project developers. It also enables a fairly easy monitoring process in terms of the achievement of the European Union's RES policy goals. By contrast, if volumes defined in terms of budget apply, procured amounts will generally depend on the emerging price of the tender (however, restricted by a potential ceiling price). Nonetheless, given that different RES technologies (and different installations of the same technology) differ in terms of their full load hours (FLH), capacity tenders may nonetheless lead to deviations of the actual energy generation from estimated energy production based on actual FLH of awarded projects. These uncertainties are particularly prominent in case of technology-neutral capacity tenders, as the same tendered capacity may result in different energy amounts and thus different statistical benefits attributed to Member States depending on the awarded technology mix.

Alternatively, the total tender volume may be defined in *terms of budget* and capacities will be tendered until the budget is depleted. This entails the advantage that Member State budget commitments can more easily be translated into available tender volumes. In case capacity is tendered, on the other hand, available funds contributed by Member States would have to be translated into a minimum tender volume, considering a certain reference support level. Additional volumes could be tendered if the tender results in a lower price than the reference price.

Moreover, the auctioned volume may also be defined in *terms of generation (i.e. MWh)* over the course of a given time frame or an actual annual average. In this case, RES projects would receive support payments (most likely per MWh) until the generation-based target volume is reached. From the viewpoint of the auctioneer, this allows for easy monitoring of the achievement of policy goals given that European Union RES goals are expressed in terms of RES share in gross final energy consumption. Moreover, participating Member States would know ex-ante how much energy production and corresponding statistical benefits they would receive based on their financial contribution. On the other hand, generation-based tender volumes induce significant risks for bidders as they would have to commit to the delivery of a certain energy amount rather than delivering a certain capacity over which they have greater control. More specifically, RES technologies such as solar and wind are subject to intermittent energy production, which creates risks in terms of over- or underproduction with reference to tahe tender volume for which support payments are disbursed. This risk is increased if support is paid to projects based on pre-defined annual delivery, i.e. bidders are obliged to pre-determine an annual delivery amount for which they receive support. In this case, bidders may be faced with penalties in case of underproduction and do not receive additional support payments in case for overproduction. To mitigate these risks for intermittent RES technologies, banking and borrowing of energy production over a longer period may be implemented and/or a generation range (max./min.) of annual delivery amounts may be defined. For other dispatchable RES technologies, such as biomass, generation-based volumes are generally less problematic.

2.6.2 Single- vs. multi-item tenders

In *multiple-item tenders*, a certain capacity (MW), energy amount (MWh) or budget (€) is awarded. This amount is a divisible good, i.e. support is allocated to several bidders/projects. Bidders compete with their pro-jects at sites selected (and potentially pre-developed) by themselves. Winning projects are accepted until the target tender volume is reached.

In *single-item tenders*, several bidders compete for one project/site (e.g. the area for constructing an offshore wind farm), i.e. only one winner exists. Single-item tenders usually require the auctioneer to pre-develop the site to a certain degree (e.g. including environmental evaluations, measurement of resource availability, evaluations on geological structure). Bidders then compete for the right to construct their renewable installations at this specific site. Usually the grid infrastructure is also developed and constructed in parallel to the renewable energy project.

2.6.3 Auction format and pricing rule

The organisation of tenders should fulfil three general principles: the submitted bids are binding; the bidders with the best bids win and the winning bidders receive at least their bid price. Three fundamental types of tenders (static, dynamic and hybrid) fulfil these criteria, all of which have been used in tenders for renewable energy. In principle, each of these types can be further segmented by their payment rule which is either discriminatory (i.e. pay-as-bid) or has uniform prices (i.e. uniform pricing, pay-as-clear).

The most common tender formats for RES are *static (also called sealed-bid) tenders*, i.e. all bidders simultaneously submit their bids and bid prices are unknown to all other bidders. The auctioneer ranks and awards projects until the cumulative volume equals the tendered volume. This tender format is called "static" as all bids are submitted only once, making it impossible for competitors to react to other bid decisions.

Static tenders can have different *pricing rules*, i.e. pay-as-bid tenders or uniform-price auctions. In a *pay-as-*

bid tender, winners receive their offer price (also known as a discriminatory price auction). In a *uniform-price tender*, winners receive the market clearing price (also called pay-as-clear auction).

In contrast to the sealed-bid one-shot situation in static tenders, *dynamic tenders* offer bidders the opportunity to observe the development of the auction price and other bidders' bids during several phases and hence to adapt their bidding strategies during the tender process. Two major types can be distinguished: ascending and descending clock tenders.

In an *ascending clock tender*, the auctioneer declares the maximum remuneration in each phase. The first phase starts with a comparatively low price. Bidders willing to realise a project at this price submit a bid and receive an award, under the condition that the tender volume has not been exhausted. The price is then increased continuously within predefined fractions of time across the different tender phases and bidders signal successively their acceptance of the recent price. Hence, bidders are awarded one after another until the demanded amount of RES-E is reached. Bidders that wait until later rounds must weigh the benefit from receiving a higher remuneration against the risk that the tender will be closed before they are awarded.

In a *descending clock tender*, the auctioneer begins the process by announcing a price that is considered high. Bidders reveal the quantities which they want to offer at the stated price. If the offered quantity is higher than the tender volume, the auctioneer announces a lower price, and bidders reveal the quantities which they want to offer at the new lower price. This process continues until supply meets demand, which results in the clearing price. Consequently, those bidders are awarded who still offer volumes at a remuneration level at which supply equals demand.

In addition, tenders sometimes represent *hybrid* structures, i.e. they combine characteristics of both static and dynamic auctions. A hybrid tender may, for example, implement a first phase with an ascending or descending clock tender, followed by a second phase using a sealed bid tender. This hybrid structure would aim to provide some price discovery for bidders in the first phase, while the second phase would be limit opportunities for collusion. For renewable energies, such hybrid tenders have for example been implemented in Brazil. However, hybrid tenders are usually more complex than their non-hybrid counterparts.

For the European Union -wide mechanism, it is crucial to select a tender format that leads to efficient tender results and minimises transaction costs for all parties involved. Moreover, given the inherent complexity of organising European Union -wide tenders, simplicity should be an important criterion when selecting the tender format and the applicable pricing rule.

In this respect, static tenders are generally more advisable under each of the mechanism's technology windows compared to the more complex dynamic tender formats. This is because the simplicity of static tenders reduces participation costs as well as bid preparation and auctioneer administration. Moreover, opportunities for collusion among bidders is low, as participants are not able to use bidding to signal or communicate (which is the case for dynamic tenders).

With respect to the chosen pricing rule, pay-as-bid tenders entail several dedicated advantages relevant for tenders under the mechanism. The main advantage of the pay-as-bid tender is that bidders have no uncertainty as to their award price in case of winning, because they receive exactly their bid. This pricing rule is also relatively robust against unfavourable, strategic bidding behaviour even under specific market conditions such as immature markets, or markets with inexperienced bidders. Moreover, the simplicity of this pricing rule also pertains to the fact it is relatively easy to understand and usually perceived as "fair" by tender participants and the public, and therefore enjoys high acceptance.

However, as this pricing rule leads to different remuneration levels for different bidders, it provides incentives to place bids above their true costs (i.e. "bid shading"), the extent of which depends on their assessment of the level of competition. Hence, in a pay-as-bid tender, bidders with good market knowledge (e.g. bidders with larger portfolios or better market intelligence) are generally favoured over less informed competitors. This effect should be adequately considered and monitored when conducting the tender.

In theory, uniform pricing can somewhat mitigate the risk of bid shading. This is due to their characteristic of producing one uniform price across all actors, whereby bidders are incentivised to submit bids at their true cost, i.e. their indifference value. However, the uniform pricing rule is only incentive compatible under particular assumptions that are rarely present in realistic tender implementations, including in the mechanism's tender rounds. As soon as bidders participate with more than one bid per round (i.e. multi-item auction) or in more than one tender round (i.e. multi-round tender) or their costs have some common components (e.g. PV-module prices), their incentives alter, and the advantage of the uniform pricing rule becomes less prominent. Under these common tender scenarios likely to be found in the mechanism (e.g. multi-item tenders), uniform pricing will not necessarily lead to superior results in terms of its tendency to reveal bidders' true costs as compared to a pay-as-bid pricing rule. Furthermore, in the context of a tender round under the mechanism that involves several hosting Member States that each have defined maximum capacity to be offered that is lower than the overal volume of the tender round

Furthermore, a tender round under the mechanism is likely to involve several hosting Member States that each have defined a maximum capacity to be offered that is lower than the overal volume of the tender round. The national maximum capacities than effectively act as sub-quotas. If uniform pricing was implemented in such a context, the market clearing price would generally be defined by projects from hosting Member States that have a higher need of support (e.g. due to lower natural potential, lower market values or higher costs of capital). Since the differences in need of support between countries can be very significant, uniform pricing would inevitably lead to overcompensation of projects from hosting Member States with lower need of support payments. This would effectively annul the support cost saving potential of cross-border auctioning. Hence, in case multiple Member States participate as hosts and define national maximum capacities that are lower than the tendered volume (i.e. national sub-quotas), the pay-as-bid price rule should be implemented to avoid excessive producers' suprlusses in countries where lower support costs are required.

2.6.4 Qualification requirements

Bidders and their bids typically need to comply with certain eligibility or pre-qualification requirements. They aim to ensure the seriousness of bids, i.e. to prevent bidders from participating in a tender with no serious intent to realise the project, and to increase overall realisation rates. In addition, prequalification requirements may be used to pursue secondary objectives, e.g. to increase actor diversity or specify the technological equipment to be used. Setting adequate pre-qualification requirements can be challenging, however, as they highly affect risk levels of participating bidders and hence bid prices and competition levels.

In the following section a high-level recommendation is provided regarding the level of pre-development required from bidders, i.e. whether early or late tenders should be implemented. This is followed by guidance on the three types of pre-qualification criteria, namely material pre-qualification requirements, financial guarantees (bid bonds) as well as additional eligibility requirements or restrictions to pursue secondary policy goals (not discussed in detail).

Required pre-development from bidders (early-vs. late tenders)

Project development generally starts with a planning stage, followed by the permit approval process, construction, and then operation. Tenders can take place at different stages of this project development process. They can be conducted rather early in the project planning process (so-called early tenders) or projects can be required to wait until e.g. after the permitting procedure to participate in a tender (so-called late tenders), with implications on costs, risk level, realisation probability and actor composition.

- An early tender takes place at an earlier stage of the project development process, where crucial planning permits and a grid connection are yet to be obtained. This implies lower risk for the project developer as they need to invest less in the project before participating in the tender and therefore have lower sunk costs. However, it also implies a higher risk of project failure after the tender award – either because the project developer cannot obtain a certain permit, or because the developer underestimated its costs as e.g. it had insufficient site data before bidding.
- A late tender takes place at a later stage of the project development process, for example once planning permits and a grid connection have been secured. This implies higher pre-development costs for the developer before the tender, but also a higher chance that the awarded project will be realised. Most countries have opted for late tenders in their RES tender design. Note in this context that late tenders can be implemented explicitly via material pre-qualification requirements or implicitly via (short) realisation periods to be complied with by the successful bidder after the bid award decision has been taken.

International experience has demonstrated that the implementation of late tenders is usually advisable, given the benefits in terms of increasing realisation rates. However, the non-comparability of relevant planning and approval procedures across hosting countries may inhibit participation for developers with projects located in certain countries. For instance, a project developer with a project located in one country and intending to participate in a tender under the mechanism, may be subject to substantially longer national permitting procedures than a competitor developing a project in another country. In order to obtain the (explicitly or implicitly) required permits to participate in the tender, they will therefore need to begin the pre-development of the project significantly earlier than project developers with projects located in countries with faster and less burdensome approval processes. As a result, the affected project promoter will typically incur higher risks and costs and be systematically disadvantaged in the tender compared to other bidders with more favourable national framework conditions.

Material pre-qualifications

Material pre-qualification requirements entail standardised proof of project progress, such as an environmental permit, an approved zoning or development plan or a grid connection agreement. This is to ensure high realisation probability, given that participating projects have already incurred some of the risks pertaining to the initial planning phase (e.g. permits, securing a location). However, material pre-qualifications requirements occur at an increased (sunk) cost for the bidder, i.e. are not reimbursed in case the project is not awarded, which results in additional risks. As a result, high sunk costs can prevent project developers from participating in the tender in the first place, therefore restricting competition.

While adequate material pre-qualifications have generally proven to be an important safeguard for successful project realisation, they have typically been implemented in national tenders, where applicable framework conditions are similar for all projects (e.g. in terms of national planning and permitting procedures). The mechanism's European Union -wide tendering, by contrast, implies that different project developers would face different national framework conditions depending on the hosting country which their project is located in. As such, it is likely not to be feasible to define comparable material pre-qualification requirements that can be applied across all participating countries.

Financial guarantees (bid bonds)

Financial pre-qualification requires bidders to present a financial guarantee when entering the tender and/or upon being awarded a bid. This can be done via bank guarantees or a cash deposit in a designated bank account (i.e. a bond). The financial guarantee is usually linked to penalties, as the guarantees can be retained in case the bidder does not live up to its contractual liabilities, e.g. in terms of realising the project within the agreed realisation period.

Financial guarantees come with several advantages. First, (post-award) financial guarantees and the linked penalties in case of non-realisation have demonstrated a good international track record of providing safeguards for project realisation and avoiding delays. Second, they are less prone to be adversely affected by different national framework conditions such as permitting procedures, i.e. are more easily comparable across participating countries. Finally, they reduce administrative burden for the auctioneer compared to material pre-qualifications in case bidders opt for a bank guarantee, given that an external institution assesses the creditworthiness and/or liquidity of the bidder.

On the downside, if financial guarantees are set too high and/or too difficult to obtain, this may discourage participation of especially smaller actors (since high bid bonds require a higher creditworthiness) and thus induce significant barriers for these actors.

We recommend implementing financial guarantees for the bid-stage (pre-award) in each of the mechanism's support windows to ensure that only serious bids participate in competitive tender rounds under the mechanism. Such pre-award guarantees may be set at up to 1% of estimated project costs. In addition, we recommend the implementation of post-award financial guarantees to increase realisation rates. Our specific recommendations on these financial guarantees as well as the related realisation periods and penalties are discussed in more detail below.

2.6.5 Realisation periods

The realisation period specifies the time during which projects need to be commissioned, i.e. the validity of the award. If the realisation period is exceeded, i.e. a project fails to be completed in time, penalties can be imposed.

In general, excessively long realisation deadlines are undesirable because they encourage speculative bids (e.g. developers speculating on equipment costs to fall). Nonetheless, they should allow for project completion times that are realistic for the local market.

To ensure a certain level of pre-development at the start of each tender round under the mechanism, delivery periods should usually be rather short, while at the same time reflecting context- and technology specific particularities. Two options are possible in this respect: country-specific and/or technology-specific realisation periods.

- In principle, contracted delivery periods should be technology-specific and reflect realistic project delivery periods for each technology, given that the latter differs considerably between technologies. While the realisation of offshore wind projects, for instance, may take up to several years, solar PV projects can often be realised within a few months. In technology-neutral tenders under the mechanism, realisation periods may nonetheless be set uniform across technologies if the aim is to select projects and technologies with the lowest delivery times.
- Country-specific realisation periods may be set to account for varying framework conditions leading to diverging realisation periods. However, their implementation may decrease transparency and reduce competition between national frameworks conditions towards best practices. Therefore, setting uniform delivery periods across hosting Member States for all tender rounds under the mechanism may be more straightforward.

2.6.6 Penalties (combined with financial guarantees/bid bonds)

Penalties aim to ensure the effectiveness of the tender by reducing the chance of delays, underperformance or non-realisation. For example, penalties are often imposed if project start-up is delayed or if the installed capacity is lower than what was awarded (i.e. underbuilding). Penalties for non-completion can also be a way to discourage strategic underbidding. They alter the economic consideration of developers, increasing the incentive to avoid non-completion. This pushes participants towards cost-reflective bids. On the other hand, harsh penalties can lead to substantial risks for bidders and high bid prices (if participants price the penalties into their bids). If penalties are too large and financial guarantees too difficult to obtain, they may deter developers from participating and hence limit competition.

Besides the full or partial confiscation of financial guarantees/bid bonds, penalties can take several forms such as the termination of contracts, lowering of price levels or the shortening of contract validity periods by the time of the delay.

We recommend (post-award) financial guarantees and the associated penalties in case of non-delivery or delay beyond the contractually agreed realisation period. Such financial guarantees can be linked to penalties, as they can be retained in case the bidder does not fulfil its contractual requirements.

When determining the extent of penalties, a right balance needs to be struck between accessibility, including by smaller actors (since high bid bonds require a higher creditworthiness) on the one hand, and avoiding the risk of non-realisation on the other hand. If penalties are set too strict and financial guarantees are too difficult to obtain, this may lead to low participation, especially of smaller bidders, and bid prices might therefore increase. If penalties are too low, this might lead to lower realisation rates.

In general, given that we advise against imposing material pre-qualifications for tenders conducted under the mechanism, this needs to be adequately balanced by higher penalties compared to a situation where additional material pre-qualification requirements would have been mandatory. On the other hand, we also recommend implementing late tenders with rather short realisation periods. Hence, most project developers will be implicitly required to be relatively advanced in their pre-development at the time that the tender takes place, e.g. already having the planning permits and confirmation of grid connection. The combination of a lack of material pre-qualification requirements and the implementation of late tenders via short realisation periods justifies imposing relatively high (post-award) financial guarantees in the range of 5-7% of estimated project costs. In case immature and therefore more risky technologies are tendered as part of the technology-specific or project-specific window, bid bonds may be increased to up to 10%. These are rough indications. Therefore, the mechanism should provide flexibility to adapt bid bond levels (expressed in € per kW) to the context of specific tender rounds and technology windows. As a general rule, bid bonds are to be set technology-specific to reflect diverging costs for pre-development and thus varying opportunity costs of non-completion or delays.

For penalties applying in case of delays, the possibility to implement a subsequent phase-in of penalties should be considered in order limit penalty risks for bidders. For example, in case the initial realisation period (as outlined above) is exceeded by a project, only 50% of the bid bond (rather than full confiscation) would be retained. Only if an additionally granted six-month extension of the initial realisation period is exceeded, would the full bid bond be confiscated. No delay penalties apply if the project is completed within the initial realisation deadline.

To discourage strategic bidding. no support should be paid for any capacity installed in excess of the capacity awarded in the tender (i.e. overbuilding penalties). In terms of underbuilding penalties, a 5% downward tolerance seems prudent, in order to provide some flexibility for unintended shortfalls beyond the control of the project developer. As a result, if the installed capacity of the completed project is below 95% of the capacity awarded in the tender (assuming the tender awards capacity), then it will lose the amount of the bid bond per kW of capacity shortfall.

2.7 Local administrative contexts

Tenders in the mechanism are in principle open to projects located in more than one Member State. This aspect introduces direct competition between project developers from different Member States.

In principle, the form of support and the tender design will be the same for all participants in one tender round. At the same time, participants obviously can make use of very different natural resource potentials (e.g. solar radiation or wind intensity). Gaining access to these potentials is the key motivation of tendering support across various Member States. In addition, project developers also face different local market and regulatory environments. Differences between these country-specific conditions have a major impact on the levelized cost of energy (LCoE)[8] of these projects, their competitiveness and thus on the outcome of the tenders and the allocation of projects between hosting Member States.

The rules of the national regulatory framework as well as the national market conditions will remain largely unchanged in the context of tenders under the mechanism. In terms of the regulatory framework, the circumstances of the country where the installation is built apply. These wider regulatory conditions include corporate taxation, planning and permitting rules, conditions for grid connection, eligible areas and sites, and environmental requirements. These aspects cannot easily be converged or aligned, as they stem from a broader regulatory and political context and thus extend into multiple regulatory areas, including those that are not energy related. As a result, bidders from different countries inevitably face differing circumstances even though they are competing on the basis of a common support scheme design.

This sub-task discusses relevant framework conditions and the impact of diverging national planning, regulatory, administrative, political and financial frameworks and macroeconomic conditions ("framework conditions") on the results of tenders. Principles that should be reflected in the tender design, which aim at lowering the impact of differing framework conditions or to at least take such differences into account, are presented. Moreover, options to level the playing field are discussed.

---

[8] The levelized cost of electricity or energy refers to the cost of energy. It accounts for all lifetime costs of the project including operation, maintenance, construction, taxes, insurance, and other financial obligations of the project and is thus a measure of the average net present cost of electricity generation for a generating plant over its lifetime. The LCoE is usually expressed in euros or dollars per megawatt hour.

2.7.1 Impact of divergent regulatory conditions on project costs

The effects of differing regulatory conditions have been demonstrated in a study by Navigant, conducted for Agora Energiewende, comparing the impact of national policies and regulation on the cost of onshore wind across the PENTA countries (Austria, Belgium, France, Germany, Luxembourg, Netherlands, Switzerland), as well as in previous studies that, for example, analyse the cost of financing renewables in Europe.

Depending on the specific conditions, costs induced by the regulatory framework may exert a greater influence on the selection of a lowest-cost project than the availability of natural resources or their market value. The results of the cross-border solar PV tenders carried out by Denmark and Germany in the autumn of 2016, resulting in all winning bids being located in Denmark, also underlined the impact of divergent regulatory conditions. Better natural potential – i.e. higher full load hours – was only one of many local advantages for solar PV projects in Denmark that led to a one-sided result. Other reasons were related to differences in wider market conditions, which included lower land lease costs in Denmark (in Denmark solar PV projects can be developed on agricultural lands, whereas German site restrictions forbid such development) and a slightly lower tax burden compared to Germany. In addition, the competition in Denmark was much stronger due to a lack of alternatives for project support, as the support mechanism for large-scale solar PV plants in Denmark was terminated only months before the cross-border tender.

Key aspects impacting the cost of project development apart from resource availability are:

Planning and permitting procedures: Planning and permitting includes a wide range of internal and external costs borne by the project developer related to the procedures of planning and permitting (such as preliminary site assessments, securing of land, all types of assessments and permits). This aspect is important as costs, time requirements and risks related to procedures of planning and permitting vary significantly between Member States and are to a large extent driven by regulatory conditions.

Site restrictions: Site restrictions can have significant impacts on the costs of RES deployment. Most countries have various regulations that restrict the availability of land that is suitable for the development of RES projects, including minimum distance requirements from urban zones, radar towers and environmentally protected areas. Depending on the extent of these limitations and the remaining availability of land with favourable conditions, these restrictions can increase the competition for available land and thus lead to higher land leasing costs (as seen in the German-Danish cross-border tenders for solar PV). In addition, in the context of the mechanism Member States may even apply additional restrictions (or remove existing restrictions) for projects participating in the tender.

Grid connection regime: Grid connection costs includes all costs borne by the project developer that are related to the connection of the plant to the grid and, if applicable, grid reinforcement. Costs related to grid connection vary considerably between countries depending on the grid connection regime, which can be "shallow" or "deep". In addition to the grid connection costs, generators are charged for grid usage in some countries (thus increasing operational expenditures).

Taxation regime: Costs related to corporate taxation reflect a much broader area of regulation and of political priorities compared to the specific field of RES deployment. Accordingly, harmonising corporate taxation in the context of tenders implemented through the mechanism is unrealistic. Nevertheless, differences in taxation are an obvious source of distortion to cross-border competition and have stimulated public debate in the German-Danish cross-border tenders for solar PV held in December 2016.

Financing conditions (debt interest rate, share and term): The cost of capital has a major impact on the cost of RES deployment. Financing conditions – specifically, interest rates on debt financing, debt/equity ratios and debt terms – are determined by market factors and are also influenced by regulatory conditions. However, they are an important indication of the perceived regulatory risks in a Member State. They are, for instance, influenced by risks related to the support scheme design (exposure to market price and other revenue risks), planning and permitting (potential of non-realisation or changes in project configuration and operation) and political stability (potential of retro-active changes in support schemes). Specifically, the use of financial instruments under the enabling framework function is intended to address this source of cost for RES deployment and it can have a mitigating effect in terms of reducing differences between Member States participating as hosting countries in the mechanism.

Effective project realisation periods: The project realisation period encompasses all activities from the initiation of project planning to the retrieval of necessary permits, connection to the grid and the start of RES installation operation. The number of years required to realise a RES project provides an indication of the complexity of the processes involved. While regulatory requirements related to planning, permitting and grid connection reflect broader policy goals (related to, for example, environmental protection and ensuring public acceptance/participation), they can complicate the expansion of renewables and may impact the cost of deployment. Long project realisation periods increase the costs of project development as well as the risk of non-realisation. The longer it takes to acquire the necessary final permits for construction, the higher the probability that the initial planned configuration of the project will no longer be feasible, forcing the development to be terminated or reconfigured (e.g. by changing the overall size of the project, exact location, turbine specifications, etc.), which induces additional costs.

Risk of non-realisation: There are various reasons for the non-realisation of projects, including, for example, failing to receive the required permits, successful legal appeals, and regulatory requirements, or other factors that would limit the operation of the project or make it uneconomic (e.g. changing financing conditions). The average percentage of projects at the beginning of the planning stage that go unrealised is a result of the uncertainties of project development, influenced by the transparency and efficiency of administrative procedures and likelihood of legal appeal. The higher the share of planned projects that go unrealised and the later the decision to terminate a project, the higher the sunk costs that developers need to recover through successfully completed projects. In this context, also the specific local context in which a project is planned is important (related to the very specific location of the project, the project developer's strategy in project planning, the technical configuration of the project and support by local stakeholders). The impacts (sunk costs) of non-realisation depend mostly on the timing of project abandonment. The later the decision to terminate a project, the higher the sunk costs.

Options to address differing conditions in tenders implemented by the mechanism

There are various basic options to deal with differences in national investment conditions: 1) adjusting bids by the cost impact of the conditions, 2) aligning the conditions, 3) implementing quotas to limit the distributional effects of these distortions and 4) offsetting some of the conditions via financial instruments.

Adjusting bids by the cost impact of the regulatory framework: The bids of tender participants may be adjusted by the amount of cost impacts of the varying conditions. The advantage of this option is that the distortions would be reduced without having to actually align all conditions. The key disadvantage is that exactly estimating the impacts of each factor is very difficult (due to methodological restrictions and lack of data) and that there are also large variations within countries that would need to be accounted for. Another disadvantage is that this approach would undermine efficient outcomes of the tender: depending on the aim of the tender (which in the case of the mechanism includes identifying the lowest LCoE or identifying the lowest support costs) levelling certain cost factors may result in comparably cost-effective projects to be excluded from the awarded ones.

Aligning the conditions: The most unlikely option is to align the conditions in the Member States participating in the mechanism as hosts. Aligning regulatory frameworks towards good practices would be the preferred option but is unlikely to take place in the short and medium term. In the best of cases, the mechanism would trigger more coordination and alignment of national policies and regulations. However, some of the other conditions such as market values and local competition levels will not and should not be aligned proactively. In an increasingly integrated market such convergence will take place in the mid-to-long-term in any case.

Implementing quotas to limit the distributional effects of these distortions: An option which is more practical to implement would be to establish quotas of bids accepted in each country (e.g. a minimum/maximum of 20% of installations/capacities in country A). This would limit the distributional effect of the discussed market conditions and may address political acceptance issues, if due to regulatory and market conditions all projects are located in one country only. However, the extent to which the quotas become effective, they decrease the efficiency of the tender.

Offsetting some of the conditions via financial instruments: A measure which is explicitly foreseen in the mechanism is the use of financial instruments to lower the cost of capital of RES projects. The availability of a financial instrument in a particular tender round may effectively level the differences in the costs of capital between the participating Member States, by having a stronger impact on the overall costs of project development in those Member States where financing is less available and costlier. Thereby, the impact of differing national conditions on the cost of financing – one of the most important source of cost differences between Member States – can be alleviated. Furthermore, the overall cost of support would be reduced.

We recommend not to adjust the competitive tender bids. In addition, aligning all market conditions is unrealistic and not desirable. If political acceptance requires proactively influencing the distribution of selected projects among Member States, a combination of quotas and providing access to financial instruments is the most suitable option.

The tender design cannot mitigate diverging market conditions. The tender design can, however, worsen the impact of national regulatory barriers or unfavourable market conditions on the tender outcome, if these are not considered in the design. To avoid such an effect, the applicability of all design elements for all participating host Member States needs to be checked and the implementation of EU-wide material pre-qualification requirements should be avoided due to their lack of comparability. In addition, realisation deadlines should not be too short and sufficient bid preparation time should be granted to attract a large number of market actors.

3 The mechanism in (hypothetical) practice

This section puts the financing mechanism in hypothetical practice. It walks through the individual steps described in section 2.2. The hypothetical participants include Luxemburg as a contributing Member State, Greece, Estonia and Lithuania as hosting countries, and Italy and Germany in a mixed role (both contributing and hosting). Implementing the mechanism in (hypothetical) practice reveals interesting insights, which may be relevant for the actual implementation of the mechanism.

3.1 Step 1 & 2: Call for interest and expression of interest

Member States expressed the following high-level (and hypothetical) preferences. Note that in the actual implementation of the EU RES financing mechanism, the level of detail of disclosed information may differ. Member States may appear as contributing or hosting Member States or they may appear twice in this chapter (contributing and host) in case they participate in a mixed role in the mechanism (i.e. Germany and Italy).

3.1.1 Contributing Member States

The following tables provide an overview of the high-level (hypothetical) preferences of each of the contributing Member States.

Table 1: Hypothetical preferences expressed by Luxembourg as a contributor

	Luxembourg
Motivation and Background	• Meet baseline requirement of REDII and Governance regulation as well as planned trajectory in NECP (2020 RES target is met through statistical transfer with Estonia and Lithuania). RES reference points until 2030 are ambitious compared to national potential because of the formula used to calculate them (combination of: flat rate approach + natural potential + GDP + interconnections – the latter two score high in the case of Luxembourg). • Lower transaction costs compared to bilateral/"traditional" cooperation Mechanisms • Long-term solution compared to statistical transfers • Actual RES deployment triggered by contribution (an aspect which was already important to Luxemburg in the statistical transfers)
Required RES capacities	• 1,37 TWh RES need to be "realized" in 2025 based on cooperation, according to draft NECP of Luxembourg. • Luxembourg has been known to follow a diversification approach, thus half of this volume may be addressed by the financing mechanism, the other half via other cooperation options such as bilateral cooperation, the Statistical Platform or offshore cooperation. • This results in 685 GWh to be realised through the financing mechanism (for wind onshore with 2000 FLH this would result in 342,5 MW --> 350 MW).

Table 2: Hypothetical preferences expressed by Germany as a contributor

	Germany
Motivation and Background	• Showing commitment to EU instruments and gaining further experience with cooperation/opening as defined in Art. 5 of REDII on voluntary opening of support schemes. • Ensure that reference points of Governance regulation are met • Low cost RES deployment by EU-wide tenders
Required RES capacities	• Either 1.000 MW PV or 500 MW Wind onshore (assuming roughly twice the amount of full load hours for wind compared to PV) or a mix thereof, depending on available capacities in Host countries.

Table 3: Hypothetical preferences expressed by Italy as a contributor

	Italy
Motivation and Background	• Low cost RES deployment • Reaching the nationally planned contribution defined in NECP and thus effectively contributing to the overall EU RES target • Fulfilling opening obligation as required by State Aid guidelines and showing commitment to EU instruments • Counteracting domestic limitations to RES deployment
Required RES capacities	• Italy, in order to reach the planned 2030 contribution needs to double the installed wind capacity and to triple the PV capacity. • Capacity to exploit as contributing MS • 160 MW of onshore wind • 100 MW of PV

3.1.2 Hosting Member States

The following tables provide an overview of the high-level (hypothetical) preferences of each of the hosting Member States.

Table 4: Hypothetical preferences expressed by Germany as a host

	Germany
Motivation and Background	• Implementation of reciprocity concept as promoted in auction opening • Local investments and job creation
Offered maximum capacities	• Wind Onshore: none • Solar PV: 500 MW
Maximum project sizes	• Solar PV: 10 MW, in line with EEG • Onshore wind: n.a.

Site or geographical constraints	• According to EEG and existing spatial planning processes
Minimum share of statistical RES benefits to be retained for host	• 10-20%

Table 5: Hypothetical preferences expressed by Italy as a host

Italy	
Motivation and Background	• Local investments and job creation • Make use of abandoned and decommissioned industrial areas • Strengthen repowering (if possible)
Offered maximum capacities	• Wind Onshore: 300 MW • Solar PV: 200 MW
Maximum project sizes	• Wind Onshore: 50 MW • Solar PV: 20 MW
Site or geographical constraints	• Wind Onshore: None. • Solar PV: Predefined abandoned and decommissioned industrial areas
Minimum share of statistical RES benefits to be retained for host	• 30%, taking into account grid constrains and public acceptance, especially for wind on shore. • To have a clear picture of the minimum share to be reserved for Italy it would conduct a CBA study before the actual commitment in the financing mechanism.

Table 6: Hypothetical preferences expressed by Greece as a host

Greece	
Motivation and Background	• Local investments and job creation • Meeting RES targets (by keeping 30% share of the RES statistics) • Welfare impact (decreasing electricity prices) • 2.9 GW wind onshore were added in 2018 and 2.7 GW solar • Greece has a preference to add storage to RES plants as an eligibility criterion (all technologies).
Offered maximum capacities	• Wind offshore: 100-150 MW • Wind Onshore: 150 MW • Solar PV: 100 MW
Maximum project sizes	• Wind Onshore: minimum size 3 MW • Solar PV: minimum size 500 kW
Site or geographical	• Wind Onshore: Greece may indicate specific regions or areas, for instance to avoid saturation in specific areas, taking into account the existing specific

constraints	spatial planning • Solar PV: As for wind.
Minimum share of statistical RES benefits to be retained for host	• 20% (preference for 30%), taking into account grid constrains and public acceptance.

Table 7: Hypothetical preferences expressed by Estonia as a host

	Estonia
Motivation and Background	• Local investments and job creation • GHG reduction • Modernization of national energy system • Estonia added 310 MW wind onshore capacities in 2018 and 32 MW solar • For wind projects, there are no project size restrictions, but restrictions for windmill height (in some areas ~200m). This may be alleviated with a new radar system in 2025.
Offered maximum capacities	• Wind Onshore: No restriction, but realistic project pipeline will not exceed 150 MW. • PV: 100 MW
Maximum project sizes	• Wind onshore: no restriction • PV: 10 MW
Site or geographical constraints	• None
Minimum share of statistical RES benefits to be retained for host	• 10-20%

Table 8: Hypothetical preferences expressed by Lithuania as a host

	Lithuania
Motivation and Background	• Local investments and job creation • Reduced import dependency • Modernization of national energy system • Lithuania had 533 MW already installed wind onshore capacities in 2018 and 82 MW solar
Offered maximum capacities	• Preference 1: Offshore • Preference 2: PV (max 300 MW) • Preference 3: Technology-neutral auctions (across sectors) • No onshore wind in this round: Onshore wind projects are possible but there are several restrictions, such as limited options to connect to grid without substantial grid reconstruction and an almost fully used territory potential.

Maximum project sizes	• Solar PV: 20 MW
Site or geographical constraints	• None
Minimum share of statistical RES benefits to be retained for host	• 20%

3.2 Overview of Member States' preferences

The input of all participating countries results in the following overview of contributing and hosting Member States' preferences and resulting overall volumes:

Table 9: Overview of hosting Member States' preferences

	Hosting Member States					
	Germany	Italy	Greece	Estonia	Lithuania	Sum
Max capacity wind (MW)	0	300	150	150	0	600
Max capacity PV (MW)	500	200	100	100	300	1200
Max project size wind (MW)	0	50	>3	n.a.	0	
Max project size PV (MW)	10	20	>0.5	10	20	
Preference % of RES stats kept	10-20	20-30	20-30	10-20	20	

The total demany by contributing Member States amounts to the equivalent of either 1060 MW of onshore wind capacity, or 2120 MW of solar PV capacity, as indicated in the table below. Luxembourg accounts for 33% of the total demand of the contributing Member States, Germany for 47% and Italy for 20%. These percentages will be used as the distribution key for the contribution payments and the redistribution of pooled RES statistics.

Table 10: Overview of contributing Member States' preferences

		Contributing Member States			
		Luxemburg	Germany	Italy	Sum
Required GWh / year		685			
Capacity onshore wind (MW)	*Alternatives (not cummulative)*	350	500	210	1060
Capacity solar PV ground mounted (MW)		700	1000	420	2120

3.3 Step 3: Draft timetable & tender documents

Based on the expressed interest by Member States, the following draft timetable and tender design can be derived. In the course of drafting this case study and discussing it with Member State representatives the expressed interests have been refined several times. This may also happen in the course of the actual implementation of the EU RES financing mechanism.

In this hypothetical case, the EOIs show a higher overall demand by contributing countries than available capacities in host countries, which means that less than the entire demand of contributing countries can be met in the upcoming tender rounds in 2022.

Technology window: To accommodate the variety of technological preferences of host countries, this case study defines two technology-specific auctions for 2022, one tender for onshore wind and one for solar PV.

Tender volume: For both tenders, a deduction of the sum of available maximum capacity of hosting Member States was made to ensure competition between sites across countries, which is important to enable cost-efficient outcomes of the tenders. Assuming that roughly 25% of the sum of maximum capacities of hosting Member States are deducted for each technology, the tender volume for wind onshore is set at 450 MW and the tender volume for solar PV is set at 900 MW.

Form of grant: For both tenders, upfront investment support will be paid because of the administrative ease of implementation compared to operating aid. This may be changed for subsequent auction rounds.

Ceiling prices: Technology-specific ceiling prices are derived in €/kW based on calculations of the average support need per technology across the participating host Member States. To this effect, the support need per country is calculated by taking into account country specific natural potential (full load hours assuming medium site quality), expectations of market values and current financing conditions. The technology-specific ceiling prices will apply similarly for bidders in all hosting Member States. The following ceiling prices (€/kW) will apply similarly for bidders in all hosting Member States: **Wind: 640 €/kW** (equivalent to a fixed market premium of 20 €/MWh or 2 €ct/kWh) and **Solar PV: 370 €/kW** (equivalent to a fixed market premium of 25 €/MWh or 2.5 €ct/kWh).

Preferences that could not be addressed in first tender rounds include

- No repowering
- No offshore wind
- No technology-neutral auction
- No storage as eligibility criterion

This does not mean that these preferences are excluded from future rounds.

Allocation of statistical benefits to Member States: 80% for contributing Member States, 20% for hosting Member States.

Further design elements of these two multi-item auctions are determined as follows:

Table 11: Overview of tender design elements

Tender design element	Design decision	Explanation
Auctioned good	MW	MW is the auction good commonly used for these technologies, thus bidders are best acquainted to it.
Auction process	Static auction (i.e. binding bids submitted once)	A dynamic tender could incentivise unfavourable strategic bidding activity, especially in case of low competition, and is more complex to implement.

Pricing rule	Pay-as-bid	In combination with national sub-quotas within the tender volume, uniform pricing would increase the risk of windfall profits of bidders located in countries with low LCoE/high market values.
Material pre-qualification	None	As permitting procedures differ between Member States, it is difficult to identify comparable documents to proof progress of pre-development. Also, verifications could only effectively be performed by national bodies.
Financial guarantees	- Pre-award bid bonds at 1% of estimated project costs - Post-award bid bonds at additional 5% of estimated project cost	- Pre-award bid bonds deter the participation of dubious bidders - Post-award bid bonds at 5% provide a significant incentive to (fully) realize the project and thus achieve the tender's goals
Realization period	- Solar PV: 12 months - Wind onshore: 24 months	Implementation of "late tenders": rather short realisation periods to achieve results in short timeframe
Penalties	- Non-realization: Retention of the complete bid bond - Partial realisation: partial retention of the bid bond	In absence of material prequalification, the retention is an important safeguard against non-realization. The partial retention increases the incentive to realize the project to the extent possible.
Maximum project size	According to national regulation (as expressed in the EoI)	

3.4 Step 4 & 5: Binding commitments & invitation for bids

Based on the tender volume, schedule and tender design the Member States enter into (hypothetical) binding commitments. The overall availability of capacities in host Member States is lower than the requested capacities from contributing MS: As a result, the maximum financial contribution of each Member State is calculated as the percentage of all initial requests from contributors and multiplied with the ceiling price. The suggested distribution key for the contribution payments is equivalent to the contributing countries' percentage-shares in total demand, i.e. Luxembourg's financial commitment accounts for 33% of the financial support, Germany for 47% and Italy for 20%.

Note that the binding committments may result in lower actual payments by Member States, as the auction results will likely be lower than the ceiling price (when there is competition between bidders).

3.5 Step 6: Execution of competitive auction

In the following sub-chapters, auction results are shown per technology.

The bids shown for each auction are purely hypothetical. The bids are not the result of a modelling exercise and only serve for the purpose to illustrate the two-step process of ranking and selecting bids across countries. Thus, we do not claim that the bids used below are a realistic representation of bids one would see in a real auction under the Financing Mechanism. However, the level of the illustrative bids was informed by boundary conditions based on assumptions on investment needs per technology and country, as well as country-specific full load hours, market revenues and cost of capital.[9] In addition, strategic bidding considerations, e.g. bidding much higher than LCoE in expectation of low levels of competition, were assumed in the definition of the level of individual bids, which results in a large variation of bids even within a country. For example, bids for onshore wind in Italy range from 160 €/kW to 630 €/kW, which is just below the ceiling price.

The evaluation and selection of bids is done in two main steps. First, the national maximum volume capacities are implemented by individually listing bids per host country from lowest to highest bid price. Only the bids with the lowest bid price that fall under the national maximum cap will be considered in the next step. In the first step, competition is created between bids from the same hosting Member States only. In step two, all bids from all hosting Member States that passed step one are jointly listed from lowest to highest bid price, creating competition of bids across all countries. Consequently, bids are awarded until the total auction volume is reached.

3.5.1 Onshore wind

The following table shows all valid bids of the hosting countries in this hypothetical case. None of the bids shown exceed the ceiling price (640 €/kW) and/or the maximum project size of the hosting country.

The (hypothetical) bid volume (822 MW) exceeds the auction volume (450 MW) substantially, which is generally a good indication of sufficient supply being available and interest of the RES industry in the auction round under the financing mechanism.

Table 12: Onshore wind auction: Overview of all bids with indication of host country (EL = Greece, IT = Italy, EE = Estonia)

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumulated MW
1	224	42	EL	42
2	530	45	EL	87
3	198	60	EL	147
4	175	36	EL	183
5	570	18	EL	201
6	619	44	EL	245
7	577	32	EL	277
8	560	12	EE	289
9	522	21	EE	310
10	622	24	EE	334
11	598	50	EE	384
12	160	47	IT	431
13	190	43	IT	474
14	450	40	IT	514
15	355	35	IT	549
16	240	38	IT	587
17	210	22	IT	609
18	590	47	IT	656
19	630	46	IT	702
20	257	39	IT	741
21	311	33	IT	774
22	356	21	IT	795
23	390	27	IT	822

[9] To derive the boundary conditions, TU Wien made use of recent modelling works on future RES deployment, conducting scenarios for meeting 2020 and 2030 EU RES targets by use of the Green-X model. Complementary information on price trends in wholesale electricitiy markets were derived from the EEX transparency (https://www.eex-transparency.com/power/).

In a first step of the evaluation and selection of bids, the nationally determined maximum allowed capacities (i.e. national maximum caps) are implemented. To this effect, bids are listed separately according to the hosting country and ranked from lowest to highest bid price. Only the bids with the lowest bid price that fall under the national maximum cap will be considered for the awarding.

In case of projects located in Italy, which has set a national maximum of offered capacity for onshore wind at 300 MW, only the eight most competitive projects will enter the second round of bid selection (see table below), as the ninth most competitive project already exceeds the national maximum of offered capacity. Thus, the four least competitive projects from Italy (marked red in table below) will be sorted out at the first step of bid selection. The same procedure is done with bids from Greece and Estonia, each with a maximum offered capacity of 150 MW. In case of Estonia, the cumulated capacity of bids does not reach the maximum offered capacity, thus no projects are sorted out at this stage.

Bids from Italy

Table 13: Bids from Italy: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW
12	160	47	IT	47
13	190	43	IT	90
17	210	22	IT	112
16	240	38	IT	150
20	257	39	IT	189
21	311	33	IT	222
15	355	35	IT	257
22	356	21	IT	278
23	390	27	IT	305
14	450	40	IT	345
18	590	47	IT	392
19	630	46	IT	438

Bids from Greece

Table 14: Bids from Greece: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW
4	175	36	EL	36
3	198	60	EL	96
1	224	42	EL	138
2	530	45	EL	183
5	570	18	EL	201
7	577	32	EL	233
6	619	44	EL	277

Bids from Estonia

Table 15: Bids from Estonia: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW
9	522	21	EE	21
8	560	12	EE	33
11	598	50	EE	83
10	622	24	EE	107

This first step ensures that only the most competitive bids per hosting country are selected and thus taken into consideration in the second step of bid selection, which ranks all bids from all host countries that passed the first step. In this hypothetical case, significant competition can be observed both within Italy and Greece as more projects are available than the maximum volume per host country allows.

Overview of onshore wind bids from all hosting countries

The following table shows all bids that passed the first step of bid selection. The bids are once more ranked from lowest to highest bid price. Consequently, bids are awarded until the auction volume of 450 MW is reached. The first bid that exceeds the auction volume is not awarded. In this second round, bids from all countries compete against each other on support in form of €/kW, thus ensurring competition across all hosting countries. The table shows that the 15 most competitive projects are ultimately awarded. The two least competitive projects – both from Estonia – are not awarded.

Table 16: Onshore wind auction: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW	Award
12	160	47	IT	47	Y
4	175	36	EL	83	Y
13	190	43	IT	126	Y
3	198	60	EL	186	Y
17	210	22	IT	208	Y
1	224	42	EL	250	Y
16	240	38	IT	288	Y
20	257	39	IT	327	Y
21	311	33	IT	360	Y
15	355	35	IT	395	Y
22	356	21	IT	416	Y
9	522	21	EE	437	Y
8	560	12	EE	449	Y
11	598	50	EE	499	N
10	622	24	EE	523	N

The following table shows the number of bids awarded per hosting country, as well as their corresponding accumulated volume and the weighted average bid price. In total, 449 MW capaciy were awarded with a weighted average bid price of ~256 €/kW. The contributing countries therefore pay a total of € 115 million into the financing mechanism, which is paid out to the projects awarded.

Table 17: Onshore wind auction: Overview of auction results

	No. of bids awarded	Volume of awarded bids (MW)	Weighted average bid price (€/kW)
Italy	8	278	~250
Greece	3	138	~200
Estonia	2	33	~534
Total	**13**	**449**	**~ 256**

Further observations:

The onshore wind auction successfully induced competition both within and across hosting countries. The final bid selection clearly reveals differences in need of support per hosting country.

Due to the existence of national caps on the offered capacity, relatively low bids may be sorted out in step one of the bid selection, whereas more expensive bids from another country may be awarded. This can be observed as the two most expensive bids that are awarded, both located in Estonia, have a significantly higher bid price compared to bids from Italy that were sorted out due to the national maximum cap of Italy.

The result therefore highlights the importance of competition within hosting countries, especially those that offer a large share of the total supply to the auction round. It also shows that stronger limitations in the maximum capacities per host country lower the efficiency gains resulting from the cross-border auction.

The results also illustrate the clear preference for implementing pay-as-bid as pricing rule if the tender involves several hosting Member States that each offer a maximum of capacities that falls short of the total tender volume. If uniform pricing was implemented in the example above, the clearing price for all bids would have been defined by the bid from Estonia (bid ID 12), with a bid level of 560 €/kW, which is more than double the weighted average bid price of 256 €/kW achieved under the pay-as-bid rule. Furthermore, under uniform pricing, bidders from Italy could have been incentivized to bid 0 €/kW in the expectation that the clearing price is defined by bidders from other countries and is above the LCoE of projects in Italy. If such bidding behavious is widespread among Member States with lower needs of support, the selection of the lowest-cost projects is impeded.

3.5.2 Solar PV

As for the onshore wind auction, in a first step of the evaluation and selection of bids, the nationally determined maximum allowed capacities (i.e. national maximum caps) are implemented. To this effect, bids are listed separately according to the hosting country and ranked from smallest to largest bid price. Only the bids with the lowest bid price that fall under the national maximum cap will be considered for the awarding.

Bids from Italy

Italy has set its maximum of allowed capacities at 200 MW. The following table shows the least competitive bids that are sorted out due to the maximum of allowed capacities.

Table 18: Bids from Italy: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW
22	50	20	IT	20
21	90	17	IT	37
31	98	15	IT	52
34	98	19	IT	71
37	98	12	IT	83
23	100	20	IT	103
29	100	14	IT	117
38	103	11	IT	128
32	105	17	IT	145
33	108	20	IT	165
20	110	19	IT	184
30	111	20	IT	204
40	118	10	IT	214
19	120	18	IT	232
35	135	20	IT	252
27	144	18	IT	270
18	150	18	IT	288
24	160	20	IT	308
42	160	20	IT	328
17	180	20	IT	348
26	250	20	IT	368
36	280	17	IT	385
41	280	8	IT	393
25	300	18	IT	411
39	340	14	IT	425
28	370	16	IT	441

Bids from Greece

Greece has set its maximum of allowed capacities at 100 MW. The following table shows the least competitive bids that are sorted out due to the maximum of allowed capacities.

Table 19: Bids from Greece: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW
11	135	30	EL	30
8	157	18	EL	48
14	185	14	EL	62
12	190	32	EL	94
13	190	10	EL	104
7	195	24	EL	128
16	198	22	EL	150
15	225	18	EL	168
9	246	16	EL	184
10	275	24	EL	208

Bids from Estonia

Estonia has set its maximum of allowed capacities at 100 MW. Reflecting the market development of the recent years in Estonia, the cumulated volume of bids does not exceed the national maximum of allowed capacities. As a result, no bids are sorted out.

Table 20: Bids from Estonia: lowest to highest bid price

Bid ID	Bid price (€/KW)	Capacity (MW)	Location	Cumul. MW
2	360	9	EE	9
1	370	10	EE	19

Bids from Lithuania

Lithuania has set its maximum of allowed capacities at 300 MW. Reflecting the market development of the recent years in Lithuania, the cumulated volume of bids does not exceed the national maximum of allowed capacities. As a result, no bids are sorted out.

Table 21: Bids from Lithuania: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW
3	350	20	LT	20
5	355	18	LT	38
4	365	20	LT	58
6	366	17	LT	75

Bids from Germany

Germany has set its maximum of allowed capacities at 500 MW. The following table shows the least competitive bids that are sorted out due to the maximum of allowed capacities. Due to the maximum project size of 10 MW for Solar PV in Germany, a large number of bids were made.

Table 22: Bids from Germany: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW
98	165	10	DE	10
99	176	10	DE	20
71	180	7	DE	27
97	180	8	DE	35
47	188	10	DE	45
78	188	6	DE	51
101	188	8	DE	59
58	189	6	DE	65
46	190	10	DE	75
76	195	10	DE	85
93	195	9	DE	94
96	195	7	DE	101
95	198	6	DE	107
102	245	10	DE	117
52	249	6	DE	123
72	249	8	DE	131
48	256	10	DE	141
68	265	8	DE	149
100	265	9	DE	158

51	285	7	DE	165
65	286	9	DE	174
92	288	7	DE	181
53	289	8	DE	189
73	289	10	DE	199
94	290	9	DE	208
87	296	5	DE	213
57	298	8	DE	221
83	298	9	DE	230
66	299	9	DE	239
91	300	10	DE	249
84	301	10	DE	259
77	302	8	DE	267
54	305	9	DE	276
74	305	9	DE	285
89	309	10	DE	295
56	310	8	DE	303
90	310	8	DE	311
43	312	9	DE	320
88	312	9	DE	329
79	315	5	DE	334
64	320	10	DE	344
106	320	10	DE	354
59	322	10	DE	364
85	322	7	DE	371
67	325	10	DE	381
70	326	6	DE	387
107	326	7	DE	394
75	334	9	DE	403
55	335	10	DE	413
50	341	10	DE	423
45	342	9	DE	432
105	342	9	DE	441
60	345	10	DE	451
80	345	4	DE	455
86	346	7	DE	462
63	354	9	DE	471
44	355	8	DE	479
82	355	4	DE	483
62	365	10	DE	493
81	365	8	DE	501
104	365	10	DE	511
49	366	9	DE	520
69	366	8	DE	528
61	370	7	DE	535
103	370	10	DE	545

Overview of solar PV bids from all hosting countries

The following table shows all bids that passed the first step of bid selection. The bids are once more ranked from smallest to largest bid price. Consequently, bids are awarded up to the auction volume of 900 MW. Since the accumulated capacity of all bids that had passed the first step of bid selection amounts to 865 MW only, all bids are awarded.

Table 23: Solar PV auction: lowest to highest bid price

Bid ID	Bid price (€/kW)	Capacity (MW)	Location	Cumul. MW	Award
22	50	20	IT	20	Y
21	90	17	IT	37	Y
31	98	15	IT	52	Y
34	98	19	IT	71	Y
37	98	12	IT	83	Y
23	100	20	IT	103	Y
29	100	14	IT	117	Y
38	103	11	IT	128	Y
32	105	17	IT	145	Y
33	108	20	IT	165	Y
20	110	19	IT	184	Y
11	135	30	EL	214	Y
8	157	18	EL	232	Y
98	165	10	DE	242	Y
99	176	10	DE	252	Y
71	180	7	DE	259	Y
97	180	8	DE	267	Y
14	185	14	EL	281	Y
47	188	10	DE	291	Y
78	188	6	DE	297	Y
101	188	8	DE	305	Y
58	189	6	DE	311	Y
12	190	32	EL	343	Y
46	190	10	DE	353	Y
76	195	10	DE	363	Y
93	195	9	DE	372	Y
96	195	7	DE	379	Y
95	198	6	DE	385	Y
102	245	10	DE	395	Y
52	249	6	DE	401	Y
72	249	8	DE	409	Y
48	256	10	DE	419	Y
68	265	8	DE	427	Y
100	265	9	DE	436	Y
51	285	7	DE	443	Y
65	286	9	DE	452	Y
92	288	7	DE	459	Y
53	289	8	DE	467	Y
73	289	10	DE	477	Y
94	290	9	DE	486	Y
87	296	5	DE	491	Y
57	298	8	DE	499	Y
83	298	9	DE	508	Y
66	299	9	DE	517	Y
91	300	10	DE	527	Y
84	301	10	DE	537	Y
77	302	8	DE	545	Y
54	305	9	DE	554	Y
74	305	9	DE	563	Y
89	309	10	DE	573	Y
56	310	8	DE	581	Y
90	310	8	DE	589	Y

43	312	9	DE	598	Y
88	312	9	DE	607	Y
79	315	5	DE	612	Y
64	320	10	DE	622	Y
106	320	10	DE	632	Y
59	322	10	DE	642	Y
85	322	7	DE	649	Y
67	325	10	DE	659	Y
70	326	6	DE	665	Y
107	326	7	DE	672	Y
75	334	9	DE	681	Y
55	335	10	DE	691	Y
50	341	10	DE	701	Y
45	342	9	DE	710	Y
105	342	9	DE	719	Y
60	345	10	DE	729	Y
80	345	4	DE	733	Y
86	346	7	DE	740	Y
3	350	20	LT	760	Y
63	354	9	DE	769	Y
5	355	18	LT	787	Y
44	355	8	DE	795	Y
82	355	4	DE	799	Y
2	360	9	EE	808	Y
4	365	20	LT	828	Y
62	365	10	DE	838	Y
6	366	17	LT	855	Y
1	370	10	EE	865	Y

The following table shows the number of bids awarded per hosting country, as well as their corresponding accumulated volume and the weighted average bid price. In total, 865 MW capaciy were awarded with a weighted average bid price of ~239 €/kW. The contributing countries therefore pay a total of € 207 million into the financing mechanism, which is paid out to the projects awarded.

Table 24: Solar PV auction: Overview of auction results

	No. of bids awarded	Volume of awarded bids (MW)	Weighted average bid price (€/kw)
Italy	11	184	~96
Greece	4	94	~165
Lithuania	4	75	~356
Estonia	2	19	~365
Germany	59	493	~283
Total	**80**	**865**	**~239**

Further observations:

The auction successfully induced competition within hosting countries. However, it did not induce competition between projects across hosting countries since the volume of bids in the second step of the evaluation was lower than the total auction volume.

Within Germany, there is relatively little competition, only 6 of 65 bids were sorted as the national maximum of offered capacity was exceeded by about 10% only. This low level of competition within Germany may be a result of the high national maximum of offered capacity.

Again, the final bid selection clearly reveals differences in need of support per hosting country. Due to the existence of national caps on the offered capacity, projects with a relatively low need of support (i.e. low bid level) are sorted out especially in Italy but also in Greece, whereas more expensive bids from other countries are awarded. The result highlights the importance of competition within hosting countries, especially within hosting countries that offer a large share of the total supply to the auction round.

The volume of awarded projects accumulates to 865 MW and thus falls 35 MW short of the auction volume of 900 MW. This indicates that an auction under the financing mechanism may result in much lower awarded capacity than the auction volume despite the total capacity of bids exceeding the auction volume.

3.6 Resulting distribution of RES statistics

The RES statistics associated with the production of electricity of the awarded projects are distributed according to the rules defined in the tender documents. Thus, 20% of the RES statistics associated with the electricity production of each project remain with the hosting country. The remaining 80% of the RES statistics associated with the electricity production of each awarded project are transferred to the financing mechanism. The financing mechanism pools all RES statistics transferred to it and redistributes these statistics to the contributing countries based on their respective relative share in financial contributions to the mechanism, i.e. 33% of the pooled RES statistics are transferred to Luxembourg, 47% are transferred to Germany, and 20% are transferred to Italy.

The electricity production will vary per project according to its configuration, the natural potential and regulatory aspects, such as environmental requirements. In this case study, we do not aim to predict the amount of electricity production of hypothetical projects that receive an award in the financing mechanism tenders. For simplicity, we instead indicate the distribution of capacity in MW, i.e. the distribution of RES statistics is illustrated by indicating the RES statistics that are associated with the electricity production of a certain capacity. For example, of the awarded capacity of 278 MW located in Italy under the onshore wind auction, 20% of RES statistics associated with the electricity production of these 278 MW that remain with Italy is shown as the electricity production of 55.6 MW (20% of 278 MW) of the awarded capacity in Italy. Keeping in mind that actual production varies between projects, this is just an approximation to illustrate the actual distribution of RES statistics that would result from an auction under the financing mechanism. Also, it is important to keep in mind that the EU RES financing mechanism does not exactly provide certainty up-front on volumes (kWh) that Member States will receive for their money because full-load hours of awarded projects cannot be predicted. However, it is important to note that also in national support schemes (with operational support), no clarity exists with regards to the actual full load hours of projects.

In the following sub-chapters, the share of RES statistics resulting from the hypothetical auctions are shown for each participating Member State in the onshore wind auction and the solar PV auction.

3.6.1 Onshore wind

Considering the 449 MW of awarded capacity in the onshore wind auction, the RES statistics of the electricity production corresponding to 90 MW of awarded capacity (i.e. 20%) remain with the hosting countries and the RES statistics of the electricity production corresponding to 359 MW is transferred to the financing mechanism pool administered by the EC.

The following tables show per hosting and contributing Member State the share of RES statistics they will obtain. For example, Italy, which is the only country that both hosts projects and contributes to the mechanism for onshore wind projects, obtains a share of 55.6 MW for the projects it hosts and additional 71.8 MW for contributing 20% of the total financial support granted through the mechanism in this auction.

Hosting MS:

Table 25: Onshore wind auction: Share of production that remains with hosting Member States (20%) and is transferred to the financing mechanism pool

Hosting Member State	Volume of awarded bids (MW)	Share of production that remains with hosting MS (20%), in MW	Share of production that is pooled (80%), in MW
Italy	278	55.6	222.4
Greece	138	27.6	110.4
Estonia	33	6.6	26.4
Total	**449**		**359.2**

Contributing MS:

Table 26: Onshore wind auction: Share of RES production that is transferred from the financing mechanism pool to contributing Member States

Contributing Member State	Share of RES from pool	Share of RES from pool, in MW	Financial contribution in € mio.
Italy	20%	71.8	23
Germany	47%	168.8	54
Luxembourg	33%	118.5	38
Total		**359.2**	**115**

The following table shows the total share of capacity to which RES statistics will ultimately be attributed for each participating country. Based on this total share of capacity, the financial contributing in €/kW is calculated. Due to Italy's mixed role, its weighted financial contribution in €/kW deviates from the financial contribution in €/kW made by Germany and Luxembourg which only participate as contributing countries.

Table 27: Onshore wind auction: Share of total RES statistics per Member State

	Share of capacity to which RES statistics will be attributed, in MW	Share in total RES statistics	Financial contribution in €/kW
Italy	127.4	28%	180
Greece	27.6	6%	-
Estonia	6.6	1%	-
Germany	168.8	38%	320
Luxembourg	118.5	26%	320

The following illustration outlines all financial contributions as well as the attribution of RES statistics per hosting and contributing Member States for the onshore wind auction round.

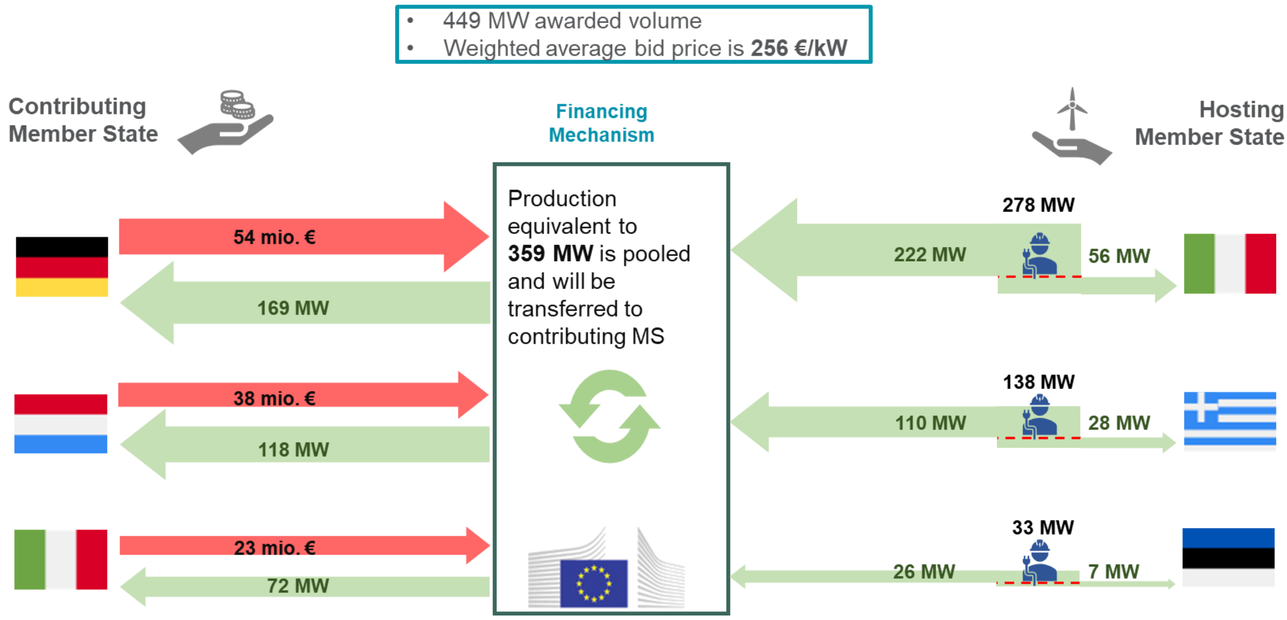

Figure 3-1: Onshore wind auction: Overview of RES statistics- and payment flows

3.6.2 Solar PV

Considering the 865 MW of awarded capacity in the solar PV auction, the RES statistics of the electricity production corresponding to 173 MW of awarded capacity (i.e. 20%) remain with the hosting countries and the RES statistics of the electricity production corresponding to 692 MW is transferred to the financing mechanism pool administered by the EC.

The following tables show per hosting and contributing Member State the share of RES statistics they will obtain. For example, Germany, which both hosts projects and contributes to the mechanism for onshore wind projects, obtains a share of 98.6 MW for the projects it hosts and additional 325.2 MW for contributing 47% of the total financial support granted through the mechanism in this auction.

Hosting Member States:

Table 28: Solar PV auction: Share of production that remains with hosting Member States (20%) and is transferred to the financing mechanism pool

	Volume of awarded bids (MW)	Share that remains with hosting MS (20%), in MW	Share of production that is pooled (80%), in MW
Italy	184	36.8	147.2
Greece	94	18.8	75.2
Estonia	19	3.8	15.2
Lithuania	75	15	60
Germany	493	98.6	394.4
Total	**865**	**173**	**692**

Contributing MS:

Table 29: Solar PV auction: Share of RES production that is transferred from the financing mechanism pool to contributing Member States

	Share of RES from pool	Share of RES from pool, in MW	Financial contribution in mio. €
Italy	20%	138.4	41
Germany	47%	325.2	97
Luxembourg	33%	228.4	68
Total		**692**	**206**

The following table shows the total share of capacity to which RES statistics will ultimately be attributed for each participating country. Based on this total share of capacity, the financial contributing in €/kW is calculated. Due to Germany's and Italy's mixed role, their weighted financial contribution in €/kW deviate from the financial contribution in €/kW made by Luxembourg which only participates as contributing country.

Table 30: Solar PV auction: Share of total RES statistics per Member State

	Share of capacity to which RES statistics will be attributed, in MW	Share in total RES statistics	Financial contribution in €/kW
Italy	175.2	20.3%	236
Greece	18.8	2.2%	-
Lithuania	15.0	1.7%	-
Estonia	3.8	0.4%	-
Germany	423.8	49.0%	229
Luxembourg	228.4	26.4%	298

The following illustration outlines all financial contributions as well as the attribution of RES statistics per hosting and contributing Member States for the solar PV auction round.

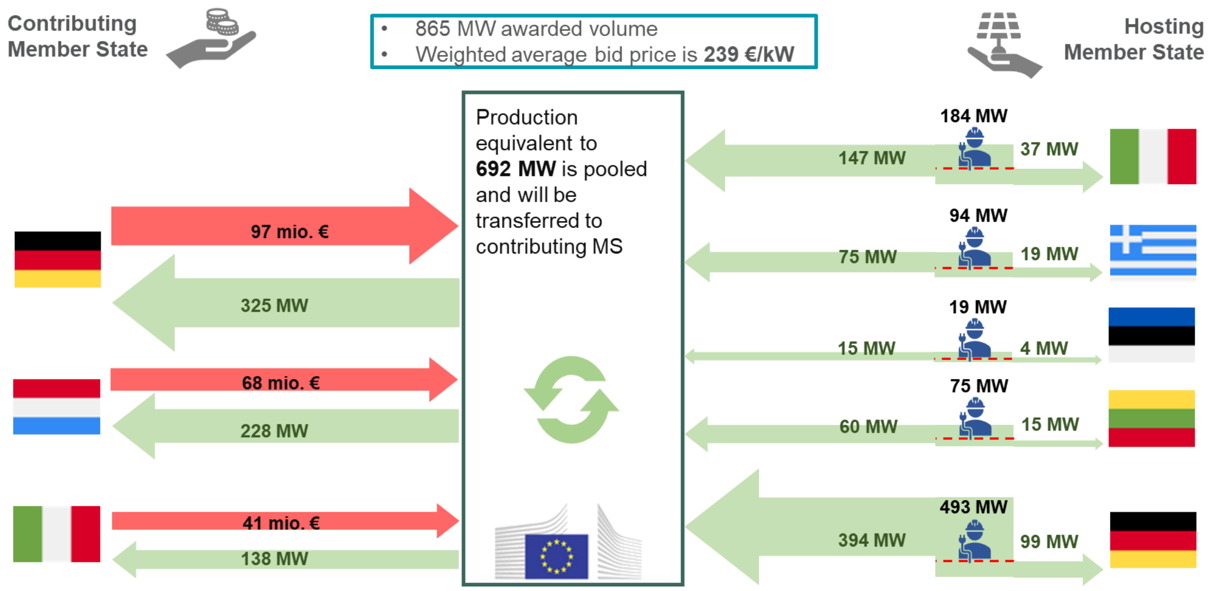

Figure 3-2: Solar PV auction: Overview of RES statistics- and payment flows

4 Lessons learnt

This case study illustrates the basic functioning of the EU RES financing mechanism and describes how it would play out in detail if several Member States participated. Member State representatives from Germany, Luxembourg, Italy, Lithuania and Estonia checked the assumptions made in this study and provided valuable input, albeit this report implies no actual commitment of Member States to participate in the EU RES financing mechanism

The report shows that the EU RES financing mechanism provides an effective tool to aggregate RES cooperation among Member States, thereby increasing the cost-effectiveness of RES support. The EU RES financing mechanism can be tailored to Member State preferences, as they define whether they want to participate and under which conditions. The contributors define volumes and maximum financial contributions. In turn, the hosting Member States define technologies, overall volumes and project sizes. Other detailed preferences of hosting Member States can also be established via local administrative conditions (e.g. eligible sites etc.).

Acceptance for RES installations in hosting Member States can be increased by retaining parts of the RES statistics for them (e.g. 80/20 as suggested in the draft regulation and in this report). The form of support in this case study was selected to be upfront investment aid, resulting in payments per kW. This form of support may be suitable in the specific context of a cross-border auction implementented by the EU Commission, although it deviates from established practice in national support schemes. It is important to have in mind that such an auction does not result in €ct/kWh but €/kW, which may require rethinking from Member States used to operational support.

Regarding the auction design, we assume, given the expressed preferences of Member States and good auction practice, that the tendered good is capacity (MW). As can be expected in most cases auctions under the financing mechanism, auctions in this case study are multi-item and static. We assumed a pay-as-bid price finding mechanism and required financial pre-qualification / bid bonds (as material pre-qualifications are not practical in the context of the EU RES financing mechanism). In addition, we assumed sufficient realization period to cover country differences in project development lead times.

The "mechanism in practice" has revealed various insights beyond the theoretical setup:

Member States showed interest in participating in the hypothetical case study. The expressed preferences evolved slightly over time, as thinking on participation advanced (regarding technologies, volumes, etc.). Not all preferences could be reflected in the two hypothetical auction rounds, but the study attempted to be as inclusive of these preferences as possible. This will also be crucial in the actual implementation of the mechanism. Relevant use-cases (with relevant volumes) need to be identified, while including as many preferences as possible. The draft timetable and tender documents help to shape Member States' preferences further (when being confronted with the details).

The execution of the tender was purely hypothetical, based on assumptions on investment needs per technology and country, full load hours, market revenues, cost of capital and resulting support needs (as upfront investment aid). It has shown that the EU RES financing mechanism improves the cost-effectiveness of support compared to purely national approaches by means of accessing better RES potential and inducing competition. Competition can be induced within Member States and across Member States. Competition within Member States occurs if more projects are available than the maximum volume per host country allows to be selected in the EU RES financing mechanism. In a first step of bid selection, only the competitive bids up to the national maximum volume (i.e. national cap) are selected and thus taken into consideration in the second step, which ranks all bids from all host countries that passed the first step.

Competition across Member States occurs if the overall available projects/capacities from all hosting Member States, considering only the bids that passed the first step of bid selection based on national caps, exceed the overall auction volume.

In our hypothetical example, the wind onshore round showed competition on national level and some competition between Member States. The Solar PV auction round however only showed competition on Member State level and not between Member States, resulting in less-than-optimal cost-efficiency. These are potential scenarios that may also occur in the actual implementation of the EU RES financing mechanism. We have seen that efficiency gains are higher the more hosting Member States participate and the greater the volume they accept on their territory compared to the contributions.

The hypothetical examples also reveal the importance of the pricing rule. If a tender under the mechanism involves several hosting Member States that each offer a maximum of capacities that falls short of the total tender volume, pay-as-bid should be implemented to avoid excessive producers' surpluses of project developers in countries where less support is required. The examples above illustrate that uniform pricing implemented across all hosting Member States inevitably leads to a much higher average support level compared to pay-as-bid and could complicate the selection of the lowest-cost projects.

The EU RES financing mechanism does not exactly provide certainty up-front on volumes (kWh) that Member States will receive for their money because full-load hours of awarded projects cannot be predicted. However, it is important to note that also in national support schemes (with operational support), no clarity exists with regards to the actual full load hours of projects. In national systems with sliding feed-in premiums (one-sided and symmetric) Member States also have no certainty regarding the support scheme payments per installation (as this depends on how market prices develop). Thus, the EU RES financing mechanism implemented with upfront investment aid is not less secure in its delivery of RES targets than most national Member States' support schemes.

The actual implementation of the financing mechanism is yet to come and will depend on the adopted implementing regulation, on the subsequently developed work programme and, in relation to that, the preferences expressed by Member States.

AURES II is a European research project on auction designs for renewable energy support (RES) in the EU Member States.

The general objective of the project is to promote an effective use and efficient implementation of auctions for RES to improve the performance of electricity from renewable energy sources in Europe.

www.aures2project.eu

AURES II has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817619